AUGUST, 1960

Plant Engineering

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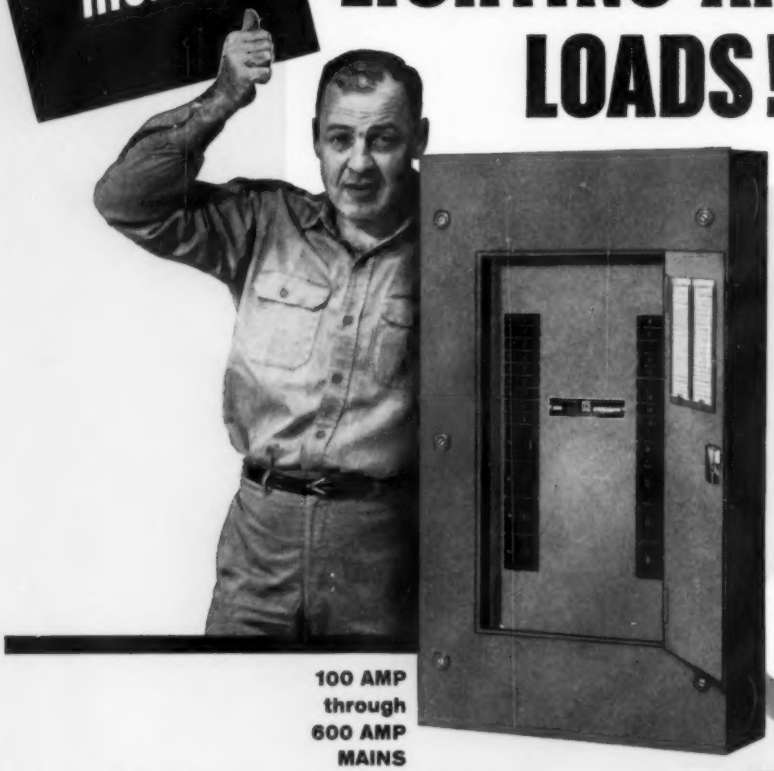

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Engineering Appointments

Charles E. Nicolas, plant engineer with the Shreveport window glass plant of Libbey-Owens-Ford Glass Company since 1941, has been named special assistant to the plant manager, John H. Goodwillie.

Mr. Nicolas, who has had wide experience in construction, will have primary responsibility for the extensive furnace rebuilding program. He began at Shreveport in the clay department in 1921, then in April, 1939, was appointed superintendent of furnace construction, and in February, 1953, was promoted to plant engineer.

Robert L. Davis, who has been assistant plant engineer in the Shreveport plant since 1953, will take over the duties of plant engineer. He joined the company's engineering department in 1948 after his graduation from the University of Toledo with a degree in mechanical engineering.

Construction Briefs Booklet 6 Now Available

READERS WHO HAVE been collecting all the Construction Briefs articles since they were first published in our July, 1953 issue, will be happy to know that the reprint for Booklet No. 6 is now available.

For any new readers not familiar with the series of articles on Construction Briefs, Booklet 1 discussed beams, reaction, bending moment, shear, moment of inertia and section modulus; Booklet 2 covered deflection, horizontal shear, floor loading, fram-

Vern Kempf Leads Workshop Group at Columbia University

OUR electrical editor, Vern Kempf, acted as a conference session leader at the recent AIPE Seminar "The Plant Engineer—Cost Reduction," held at Columbia University in New York City. The conference was sponsored by Region 1 of the AIPE.

Vern is shown in the photograph with other members of his group which included C. F. Barton, Manhattan Rubber; G. Booss, Slingerland and Booss; W. J. Conley Jr, Stromberg-Carlson Co.; J. V. Dadd, Columbia Ribbon & Carbon Mfg. Co.; G. D'Eustachio, Diehl Mfg. Co.; C. R. Doyle, Frank G. Schenuit Rubber Co.; J. D. Hesselgrave, American Cyanamid Co.; R. F. Kennedy, Daystrom, Inc.; J. Pirolli, Merck, Sharp & Dohme; R. M. Tokarz, Chesapeake Corp. of Va.; and D. A. Young, Schenley Distillers Corp.

Vern, left, with other members of the workshop group presented the seminar "The Plant Engineer—Cost Reduction" at Columbia University, New York.

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'ROUND ABOUT

ing and columns; Booklet 3 includes material on columns, trusses and connections; Booklet 4 covers fastenings for timber, design of a trussed roof and a four-part series on the structural design of an industrial building; Booklet 5 contains a seven-part series on designing reinforced concrete slabs and beams. And, now, the most recent booklet—No. 6—is on the design of reinforced concrete columns, concrete footings and retaining walls.

If you would like to receive any one or all of these booklets, send your request to the Construction Editor, PLANT ENGINEERING, 308 East James Street, Barrington, Illinois. Booklets 1 through 4 cost 50 cents each. Booklets 5 and 6 are 75 cents each. The complete package will cost $3.50.

Promotions at Firestone

Charles R. Allen, who has been plant engineer at the Des Moines, Iowa, plant of The Firestone Tire & Rubber Company, will now take over the duties of production manager.

Ants Aro, formerly assistant plant engineer, will succeed Mr. Allen as plant engineer.

Mr. Allen was graduated from the University of Akron with a bachelor

C. R. Allen

A. Aro

of science degree in mechanical engineering. In 1948 he joined Firestone's College Training Class as a technical trainee and in 1949 became assistant to the superintendent of Akron Plant 1. In 1951 he became night shift superintendent at the plant and later that year became an assistant senior project engineer in the engineering department, then senior project engineer. In 1953 he was assigned to the Des Moines plant as a staff engineer and in 1957 became plant engineer.

Mr. Aro, the new plant engineer, was graduated from high school in Stockholm, Sweden, and attended the University of Stockholm. He joined the company in Akron as a college technical trainee in 1954, and served as a junior draftsman and junior industrial engineer until 1956 when he was assigned to the Des Moines plant as a staff engineer. In 1957 he became assistant plant engineer.

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For more information about this service, contact the local General Electric Shop, or write to General Electric Company, Schenectady 5, New York.

New Appointment

Herbert W. Wrozina has been named factory manager for the new Wheatland Metal Manufacturing Co., Carnegie, Pa., plant. He was formerly superintendent of maintenance for National Electric Division of H. K. Porter Company's plant at Ambridge, Pa. He previously was plant superintendent of the company's Linden, N. J., facility.

Prior to his service with National Electric, he was maintenance foreman of the Winchester Repeating Arms Division of Olin Mathieson Chemical Corporation at New Haven, Conn.

How To Handle Isocyanates

RECOMMENDATIONS for the proper handling and storage requirements for isocyanates are now available in a handy booklet.

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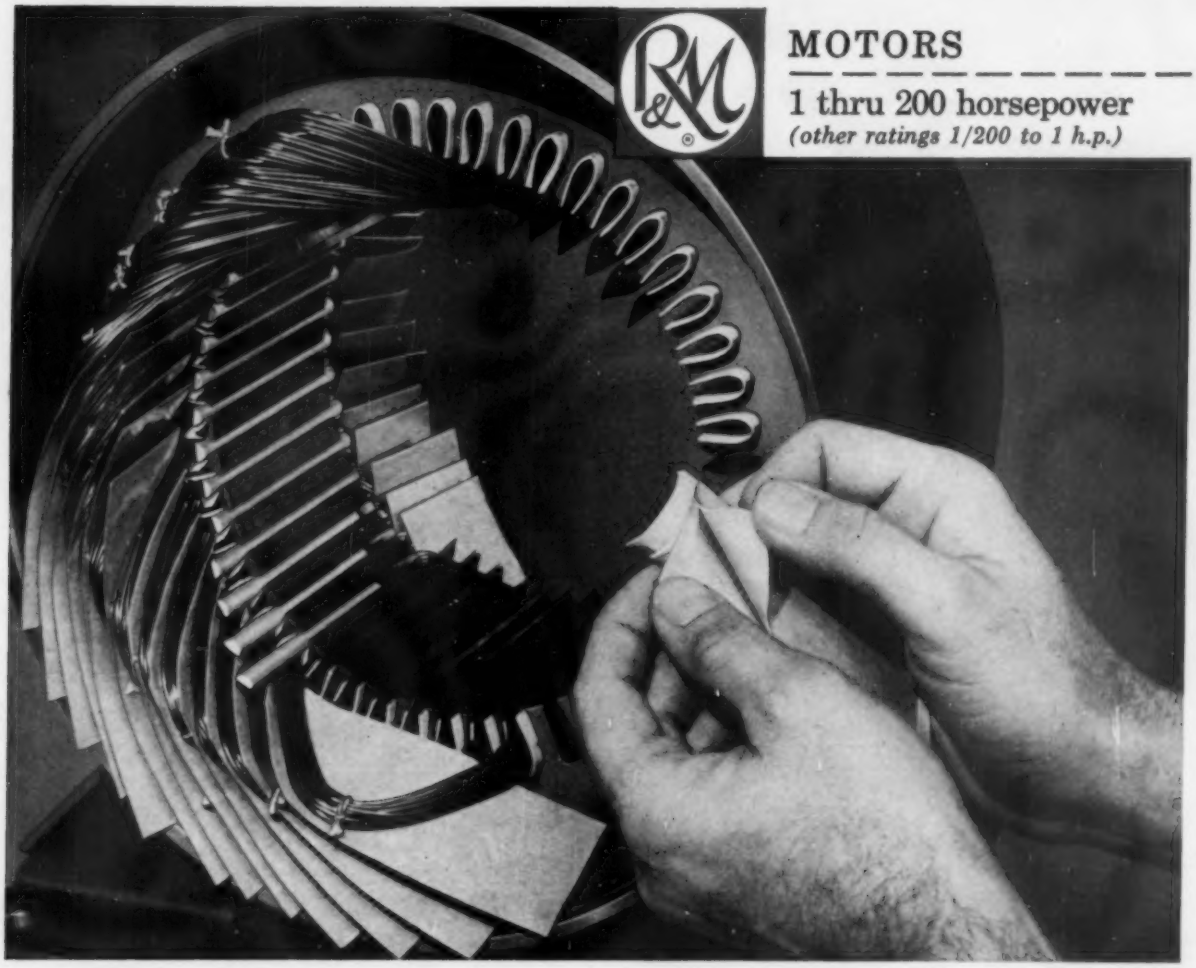
Information is also included on temperature and moisture control, avoiding health hazards, first aid, type of safety equipment and ventilation.

Copies of this storage and handling guide may be obtained by requesting bulletin C-3 from Allied Chemical's National Aniline Division, 40 Rector St., New York 6, N. Y.



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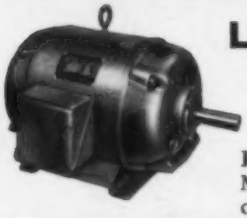

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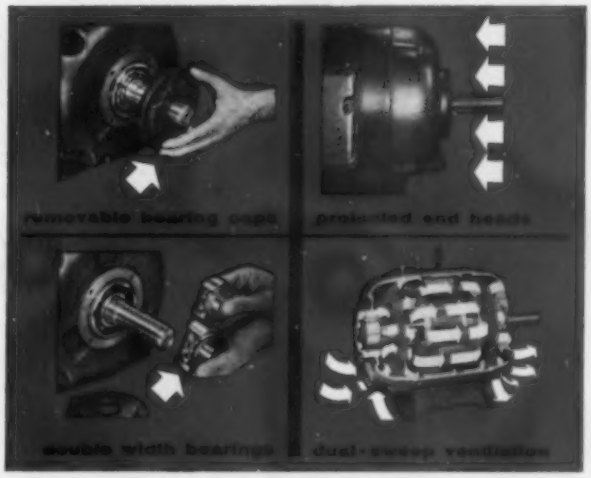

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HELPFUL WATER CONDITIONING DATA FROM BETZ

WATER . . . IN AIR

■ Failure of equipment and excessive maintenance costs will result unless proper methods of chemical feed and control are employed

AIR CONDITIONING is a development of this modern age that pays for itself. The trend for air conditioning continues upward at a rapid rate. Theaters, department stores, practically all kinds of commercial establishments and public buildings have adopted air conditioning for comfort. The trend toward industrial air conditioning is also on the rise. In earlier years, only those industries that required close control of temperature and humidity for product quality adopted air conditioning. Now, however, the desire to maintain employee efficiency, as well as production efficiency are additional factors that make air conditioning a wise investment. Achieving the benefits of air conditioning, and assuring payout on this investment is largely contingent upon one important factor—water.

Initially, little attention was given to the water used in air conditioning systems. However, it was soon found that water plays an important role in the proper functioning of air conditioning systems. The system piping, the heat exchangers, and all parts exposed to water may be affected by corrosion, by scale or sludge accumulation and by slime formation. These problems can lead to the loss of heat transfer, restriction of water flow, inefficient operation and excessive maintenance costs; or in severe cases to failure of the equipment and high replacement costs.

Water Circuits

Air conditioning installations are so varied as to components that a number of water circuits are possible. Figure 1 illustrates a simplified flow sheet of a central air conditioning system used in large installations. The three water circuits encountered are the chilled water which is in a closed circuit, the spray water which serves the air washer and the tower water which serves to condense the refrigerant. Figure 2 illustrates a simplified diagram of a small air conditioning system served by a reciprocating compressor and an evaporative condenser. The only water circuit is in the evaporative condenser. Although there are many types of arrangements possible, each of the water circuits must be given proper consideration to avoid serious problems.

Water Problems

Corrosion

Most waters are corrosive to metals because of the presence of oxygen in the water. In air conditioning systems the water comes in contact with large volumes of air and therefore the water is continuously saturated with oxygen. Often the air may be contaminated with other corrosive gases such as sulfur dioxide and carbon dioxide which are present in flue gases discharged from smokestacks. These gases dissolve in water to form acids. The combination of dissolved oxygen and the acid formed from sulfur dioxide causes a particularly severe corrosion problem. Other factors, such as the presence of dissimilar metals, high concentrations of dissolved mineral salts—particularly chlorides, deposits of slime, scale, dirt, etc. all add to the corrosive action of the water.

Scale

In areas where the water is high in hardness, scale formation frequently is the principal problem. The calcium and magnesium salts naturally present in the water are primarily responsible for scale formation. If large amounts of these salts are present in the water, they will form deposits when the water is heated or concentrated by evaporation. The major problems produced from such deposits are loss in heat transfer, increased head pressures and clogged spray nozzles, all of which result in loss of efficiency.

Scale formation usually refers specifi-

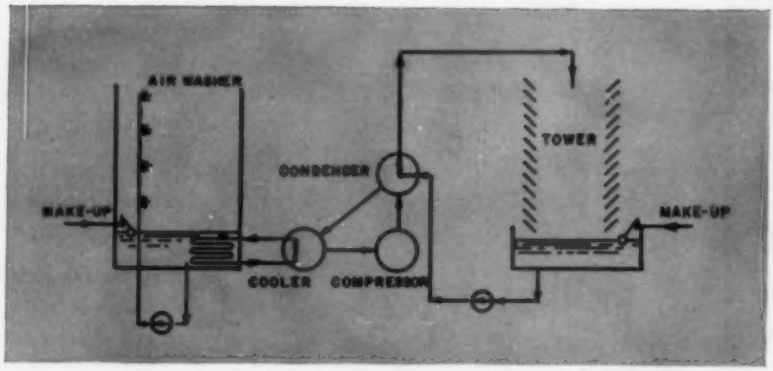

Figure 1—Simplified flow sheet of a central air conditioning unit with a closed chilled water circuit.

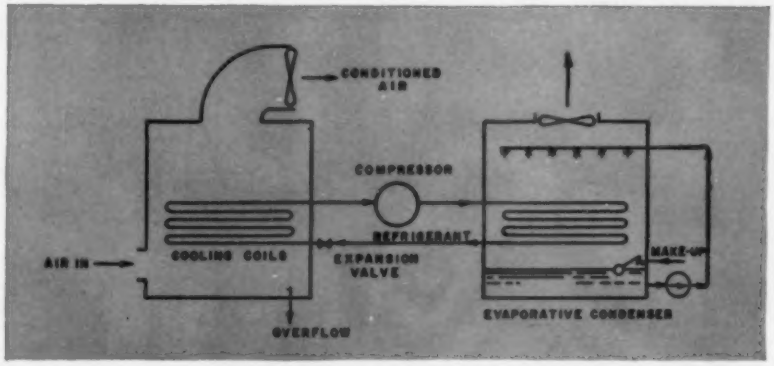

Figure 2—Simplified diagram of a small air conditioning system with one water circuit.

cally to the deposits formed from the calcium and magnesium salts. Other deposits such as slime, corrosion products, dirt and debris, however, can produce the same adverse effects.

Slime and Algae Growths

Slime and algae growths in air conditioning equipment are primarily the result of air-borne organisms. The large ratio of air to water in air washers, evaporative condensers and cooling towers, provides the opportunity to continuously inoculate the water with bacteria, fungi and algae. Heavy growths can develop in the presence of an adequate food supply and the favorable temperatures that exist in these systems. These biological growths can seriously interfere with heat transfer, clog spray nozzles and screens as well as cause corrosion. Growths of this type cause inefficient operation of the mist eliminator section in air washers and lead to

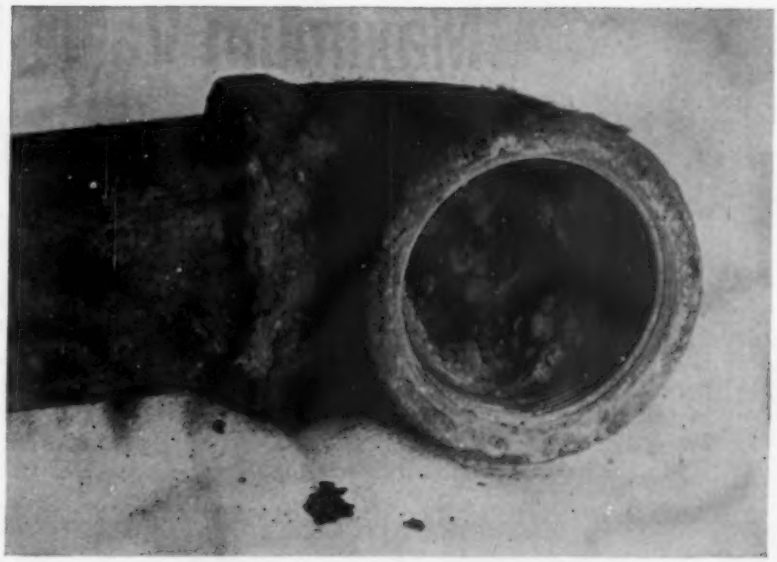

Figure 3—A section of piping from an air conditioning system showing the damaging effects of corrosion.

CONDITIONING

"water throw" into the duct work and out into the air conditioned area. Stagnant water in the ducts, and biological growths in general can impart foul odors to the air.

Treatment of the Water Circuits

Corrosion is the primary problem encountered in most air conditioning systems. The manufacturers and designers of air conditioning equipment recognize the seriousness of this problem and whenever possible employ materials of construction and design features that will minimize corrosion. They also recognize, however, that a continuous and well-controlled program of chemical treatment for the various water circuits is essential to assure maximum efficiency and life of the equipment.

The treatment of the water used in air conditioning systems does not represent an unusual challenge from the chemical standpoint. The problems of corrosion, scale formation and biological fouling are essentially identical to those encountered in most large industrial cooling water systems, for which effective and economical treatments have been developed and successfully applied. The primary difference exists in the spray water employed in the air washer which serves the dual function of cooling and dehumidifying the air in the summer and heating and humidifying the air in the winter. During the dehumidifying cycle, moisture is condensed from the air and becomes part of the spray water and this water eventually approaches the characteristics of the condensed moisture. During this cycle corrosion is the primary problem. During the humidifying cycle the moisture added to the air comes from evaporation of the spray water and as a result the spray water tends to concentrate and the dissolved salts, particularly those of calcium and magnesium may lead to scale formation. The volume of water in the air washer—particularly when a closed chilled water system is employed—is quite small compared to the large volume of air handled. As a result the characteristics of the water in the washer can change quite rapidly. In addition, the inoculation of the water with air-borne bacteria, dust, lint, and corrosive gases intensify the problem. The true challenge is not the complexity of the chemical treatment problem, but the *application and control* of the treatment to handle the constantly changing conditions. In most cases, the failure of chemical treatment has been the direct result of improper methods of application or inadequate control.

Application of Treatment

Proportional feed of treatment and continuous blowdown of air conditioning units are mandatory if good results are to be secured. Automatic, trouble-free feeding equipment has been designed to handle the rapidly changing conditions encountered in air conditioning units. The application and control of treatments for prevention of corrosion, scale and biological fouling has been greatly simplified.

The Betz approach for treatment and control of air conditioning water problems will assure protection of your investment and make air conditioning a plant facility that pays for itself. For more details on automatic, trouble-free proportioning of water treatment chemicals to air conditioning systems, write for Bulletin 597A.

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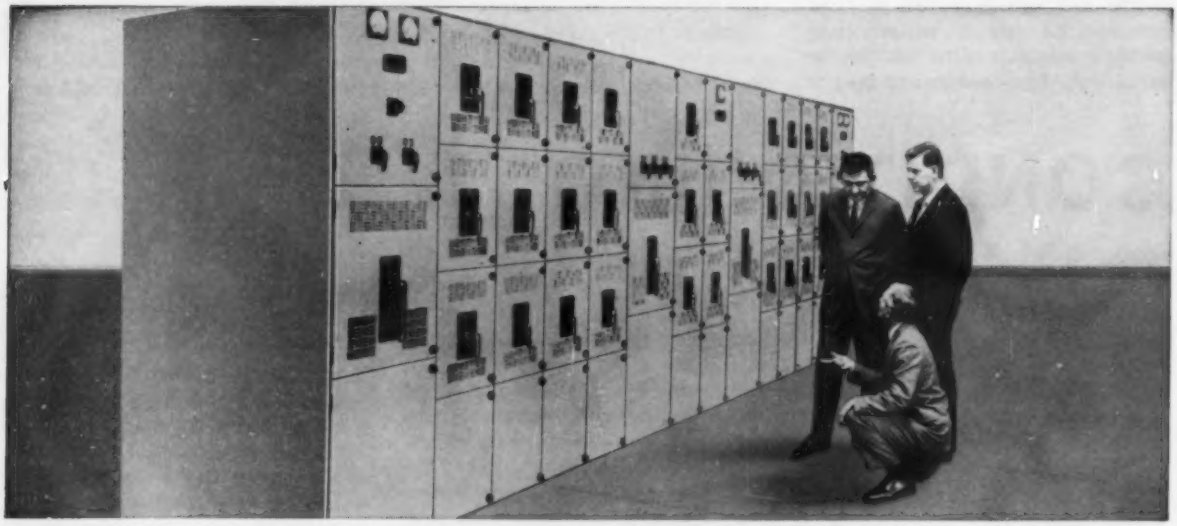
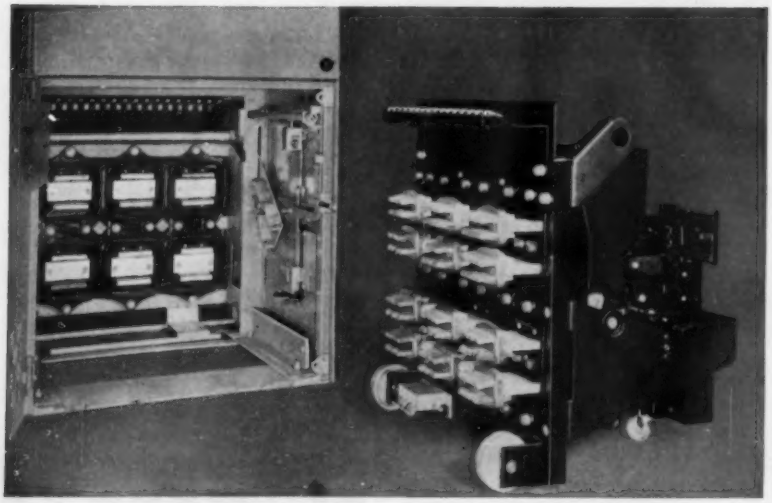
Minimum cost is possible by specifying "Standardized" over-all design. Westinghouse "Standardized" switchgear meets all normal requirements within its rated interrupting capacity . . . eliminates additional engineering and manufacturing costs of expensive "specials."

Nationwide switchgear manufacturing plants are ready to serve you . . . convenient for consultation and inspection during equipment construction. All units are thoroughly tested for conformity to NEMA standards. Where conditions permit,





Cluster-Type Disconnect Fingers permit quick inspection when breaker is withdrawn from cell. A spring-mounted floating retainer maintains full contact pressure and assures maximum current rating capacity despite minor variations in breaker alignment.

Glass Polyester Bus Supports and Short Circuit Bracing . . . provide ideal physical and electrical properties for low-voltage, metal-enclosed switchgear. The insulation is highly track resistant and flame retardant. Design of supports and bracing affords increased vertical creepage distances. Result: maximum safety with minimum maintenance.

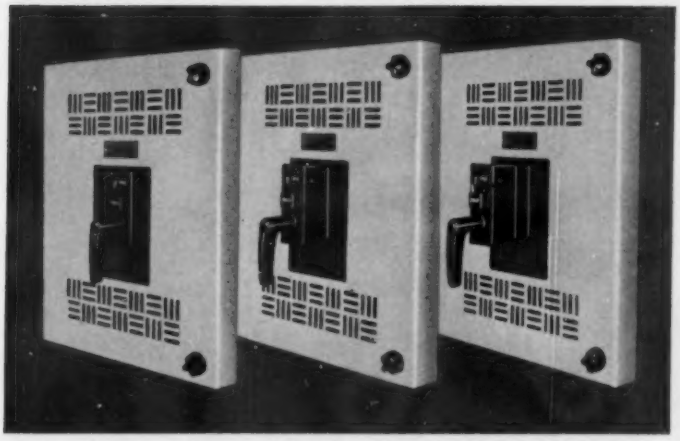
Long-Term Operating Economy

switchgear is shipped as one completely assembled apparatus.

And, mighty important . . . *Westinghouse assumes complete, undivided responsibility for the switchgear* from planning to the satisfactory overall operation of the installed equipment. For detailed information on low-voltage, metal-enclosed switchgear, call your Westinghouse sales engineer, or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

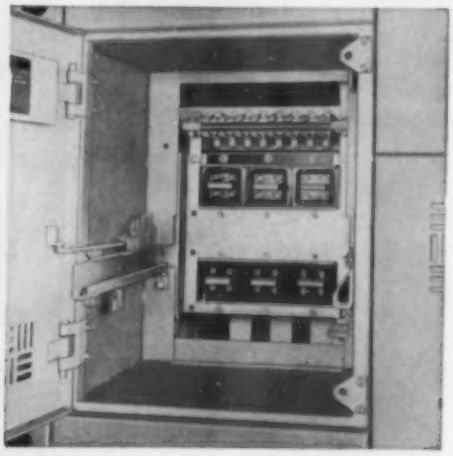
J-00094-B

YOU CAN BE SURE...IF IT'S Westinghouse



Three-Position Drawout Design permits the De-ion® type DB breakers to be in "connected"—"test"—or "disconnected" position with the breaker door closed. The breaker can be tested in complete safety and storage space for the breaker is also provided when in fully disconnected position.

Individual Breaker Compartments include interlocks and positioning devices to assure safe removal or replacement of breakers. Dead-front design provides maximum protection and safety for operators and equipment.

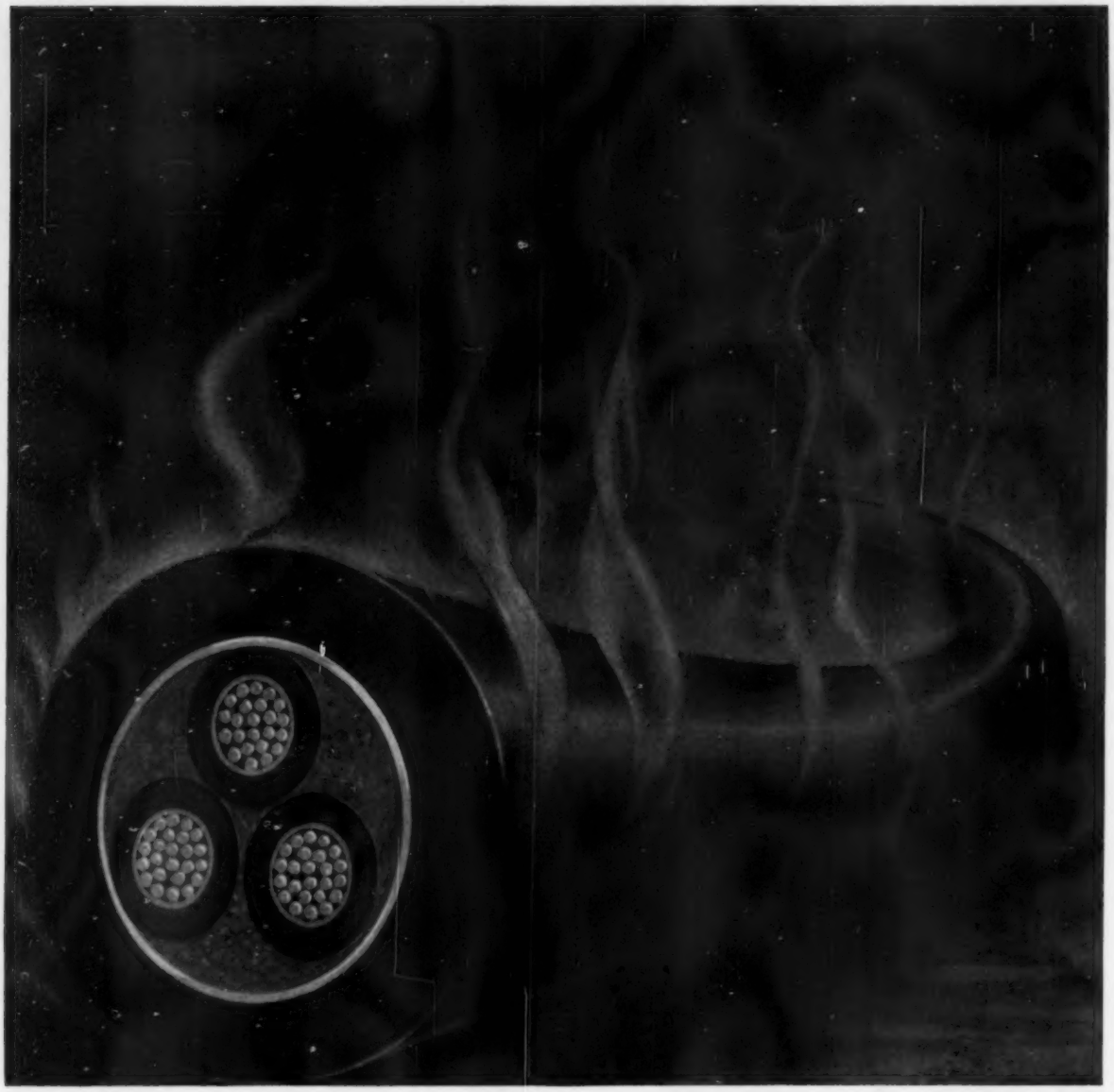


"Walk-In" Aisle provides protected work space in outdoor units. Addition of this space to the weatherproof, functional design permits easy inspection and maintenance without exposure of equipment or personnel under all weather conditions.

Three Breaker Closing Mechanisms are available to match your requirements—dependent manual, independent manual, or electric—for DB-15, DB-25 and DB-50 breakers. NEMA standards specify electric mechanism for closing DB-75 and DB-100 breakers. The independent manual mechanism, shown below, assures uniform breaker operation—regardless of operator's motion—prevents delayed closing and excessive contact burning.

For more facts circle 508 on Reply Card

Industry-proved through a quarter century of service...THERE'S NO DOUBT ABOUT NEOPRENE



HEAT AND FLAME:

two more ex-enemies of portable cord... thanks to neoprene jacketing

A sudden temperature rise during a plant emergency... an unexpected line overload... situations like these call for portable cord jacketed with dependable neoprene synthetic rubber. Neoprene jacketing not only stays serviceable at 250° F. indefinitely, it also can take emergency temperatures of 350° to 400° F. for brief periods.

Neoprene jacketing gives you increased safety, too. Neoprene will not propagate flame... helps cut down the danger of fires.

Neoprene jacketing also resists cold flow, physical abuse, sunlight, ozone, aging, oils and chemicals. This unique combination of properties makes neoprene your best choice for *durable* portable cord jacketing. No other jacketing material is so versatile... or so thoroughly proved in actual service. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department PE-8, Wilmington 98, Del.

DUPONT NEOPRENE SYNTHETIC RUBBER

Better Things for Better Living... *through Chemistry*

For more facts circle 509 on Reply Card

made with
WEATHER-RESISTANT
PARAPLEX® P-444
acrylic-polyester resin

Look for the label that assures

WEATHER-RESISTANCE

This label stands for *unmatched weatherability* among glass-fiber reinforced panels, because it signifies that the panel is made with PARAPLEX P-444 acrylic-polyester resin. Years of Rohm & Haas research on many types of resins for reinforced panels have established that the best weather resistance is achieved by a combination of acrylic and polyester resins. PARAPLEX P-444 represents the most effective combination for imparting outdoor durability, *plus* pleasing appearance, high strength, excellent light transmission, and easy installation. Only Rohm & Haas supplies this proper combination, in PARAPLEX P-444. We will be glad to send you the names of panel manufacturers.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

PARAPLEX *is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.*

PARAPLEX P-444

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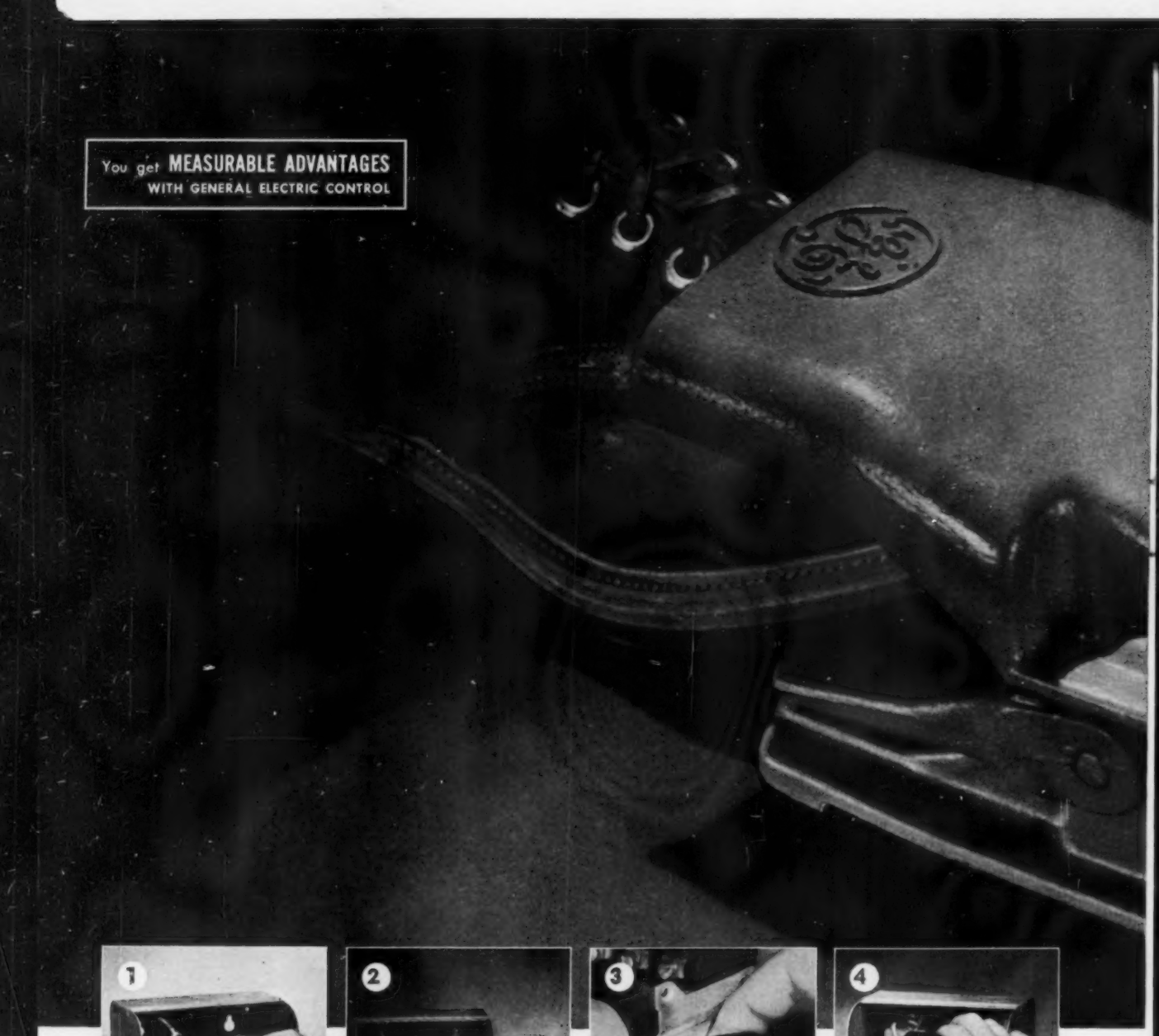
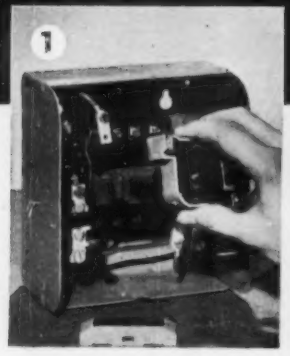
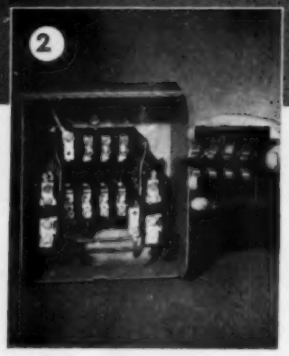
You get **MEASURABLE ADVANTAGES**
WITH GENERAL ELECTRIC CONTROL







HOW GENERAL ELECTRIC STARTER BENEFITS ADD TO SAVINGS

(1) **25-SECOND COIL CHANGE**—Without tools, without removing wiring, you can change a coil on a General Electric magnetic starter to meet different application requirements.

(2) **10-SECOND CONTACT INSPECTION**—Just lift off coil spring clamps, remove entire magnet and movable contact assembly. No tools needed, no wiring to remove.

(3) **ADJUSTABLE OVERLOAD SETTING**—A handy knob adjusts the nominal heater rating ±15% to meet special applications. No need to change or reposition heater.

(4) **VARIETY OF MODIFICATION KITS**—Seven G-E modification kits—including push button, selector switch, and indicating light—meet wide variety of application needs with minimum stock.

(5) **PLUG-IN HEATER FOR CR101 MANUAL STARTER** is offered only by General Electric. Plugs in from front in seconds; can't be installed the wrong way.

With all General Electric Controls:

LITTLE CONVENIENCES ADD UP TO BIG COST SAVINGS

This foot switch doesn't skid unintentionally. A small convenience? Perhaps. But when you consider that the operator doesn't have to continually reposition the switch, you have a measurable advantage which could add up to a big cost savings for you. All General Electric General Purpose Control devices offer measurable conveniences. Other devices, like size 0, 1, and 2 starters, offer coil change in 25 seconds . . . without tools . . . without changing wiring. Time to inspect contacts: 10 seconds! And a twist of the wrist adjusts overload settings. Plus a wide variety of easily installed G-E starter modification kits cuts stocks to a minimum. Just pick your G-E control device and there's a convenience you can measure.

Generally, conveniences don't become important —or measured—until they are missed. Why wait. Call your General Electric representative now for details or write for Bulletins GEA-7086 on Foot Switches, GEA-7020 on Magnetic Starters, GEA-6358 on Manual Starters. Let G-E control conveniences and proved quality performance add up big cost savings for you. 813-26

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 511 on Reply Card

See why ALCOA ALUMINUM makes a good design habit

Requirement: Simple, low-cost heated lines to pipe high viscosity fluids
Key to Good Design: Specify UNITRACE and DUOTRACE, Alcoa's extruded aluminum pipes with integral steam chambers

With the development of UNITRACE® Piping, ALCOA created an entirely new technique for piping viscous fluids. Trace and product chamber are extruded in a single unit of light, strong, corrosion-resistant ALCOA® Aluminum. This integral steam-traced pipe eliminates the need for cumbersome, costly, inefficient pairing of separate pipes for steam and product. The resultant savings in initial cost are coupled with a major increase in the efficiency of heat application to the product piped.

Subsequent development of special flanges, elbows, adapter flanges and UNITRACE Trace Caps has made it possible to design and install completely integrated UNITRACE piping systems . . . compatible with standard piping components.

Now ALCOA has developed a new product, DUOTRACE,* to expand the design range of integrally traced piping systems. DUOTRACE contains not one but *two* trace chambers plus a product chamber in a single extruded aluminum pipe. This makes DUOTRACE the perfect solution to the need for recirculating tracing systems.

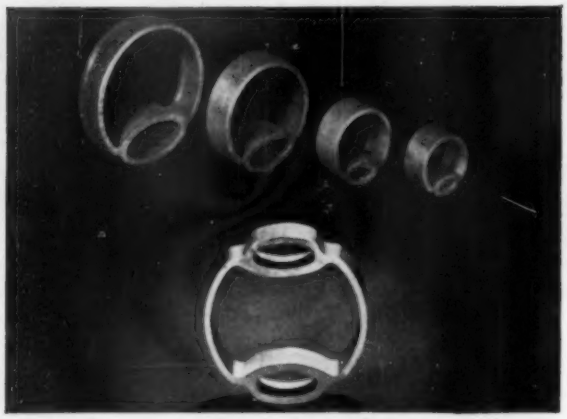
*Trademark of Aluminum Company of America

Today, the ingenuity of process industries designers has indicated intriguing new areas of potential use for both UNITRACE and DUOTRACE. Consider, for instance, the process economies which can result from the substitution of either UNITRACE or DUOTRACE for unit heat exchangers and preheaters.

Here you see an outstanding example of the way in which ALCOA is putting over 40 years of process industries experience to work to make aluminum your good design habit. You are invited to share that experience—through a series of engineering conferences which ALCOA is holding this year in a number of major cities. Your local ALCOA sales office will be happy to furnish details.

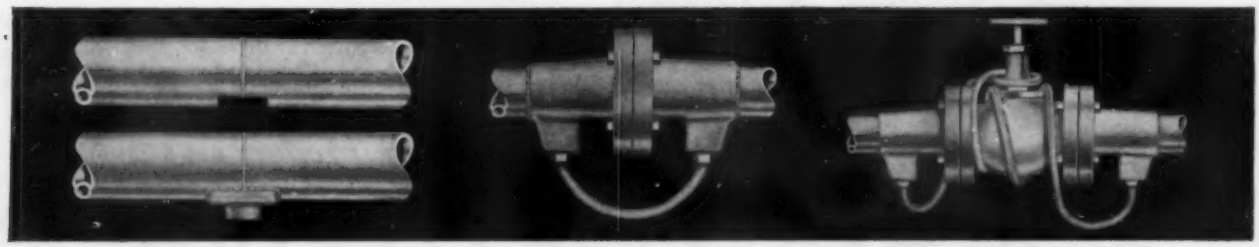
Take advantage, too, of the body of ALCOA literature which describes in technical detail the known performance characteristics of aluminum in a variety of process industries applications. Simply fill in and mail the coupon opposite. ALUMINUM COMPANY OF AMERICA, Alcoa Building, Pittsburgh 19, Pa.

World wide sales through ALCOA INTERNATIONAL, INC., 230 Park Avenue, New York 17, N.Y.

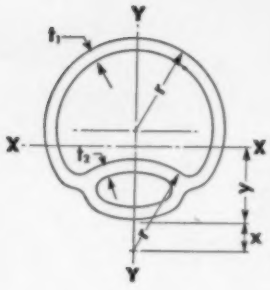


The development of DUOTRACE has opened broad new areas of design exploration in the field of heat transfer. By adding a second trace chamber to the one previously available in UNITRACE, DUOTRACE permits recirculation of the trace fluid. This opens up a whole new area of heat transfer design. Not the least of the possibilities is this: certain types of heat exchangers may now be extruded as single units. The cost savings implicit in such a unit are almost staggering. Alcoa engineers will be happy to assist you in exploring such design innovations in your own plant or process.

Fittings and connections for UNITRACE and DUOTRACE: Unflanged connections can be made easily and effectively with the special UNITRACE Trace Cap. As illustrated, trace chambers in adjoining sections are cut back and a circumferential weld is made to seal the product chamber. The cut back trace section is then covered with a UNITRACE Trace Cap welded in place with 4043 weld wire. Simple, efficient **flanged connections** utilize special UNITRACE flanges designed to accommodate both trace and product chambers. Jumper connections are used to carry the trace across the connection, and special impingement plates in the flange shield the product chamber from erosion as steam passes through the flange. **Valves, pumps and other fittings** can be incorporated into the traced systems by using UNITRACE flanges which mate with all 150-lb ASA flanges, valves and pumps. UNITRACE and DUOTRACE systems accommodate standard preformed pipe insulation.

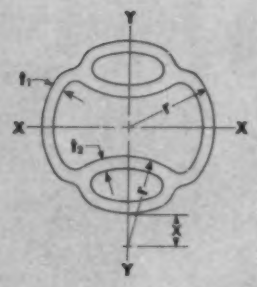


UNFLANGED CONNECTIONS FLANGED CONNECTIONS VALVES AND FITTINGS



	Unitrace Sizes	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	8 in.
Axis XX	Moment of Inertia (I) in.⁴	.09	.34	.72	2.71	6.52	31.82	81.82
	Radius of Gyration (R) in.	.37	.58	.72	1.09	1.42	2.12	2.78
	Section Modulus (S) in.³	.13	.34	.56	1.42	2.65	8.73	17.22
Axis YY	Moment of Inertia (I) in.⁴	.09	.33	.70	2.65	6.36	29.72	76.70
	Radius of Gyration (R) in.	.37	.57	.71	1.08	1.40	2.05	2.69
	Section Modulus (S) in.³	.14	.34	.59	1.52	2.83	8.97	17.79

Sizes	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	8 in.
r	.657	.950	1.187	1.750	2.250	3.312	4.312
t_1	.133	.145	.154	.170	.187	.280	.322
t_2	.145	.163	.174	.185	.200	.307	.354
x	.133	.344	.406	.625	.813	1.500	2.000
y	.61	.87	1.08	1.59	2.03	2.98	3.87



	Duotrace Sizes	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	8 in.
Axis XX	Moment of Inertia (I) in.⁴	—	—	.80	3.06	7.53	—	—
	Radius of Gyration (R) in.	—	—	.74	1.12	1.46	—	—
	Section Modulus (S) in.³	—	—	.68	1.75	3.35	—	—
Axis YY	Moment of Inertia (I) in.⁴	—	—	.67	2.59	6.29	—	—
	Radius of Gyration (R) in.	—	—	.68	1.03	1.33	—	—
	Section Modulus (S) in.³	—	—	.57	1.48	2.80	—	—

Sizes	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	8 in.
r	—	—	1.187	1.750	2.250	—	—
t_1	—	—	.154	.170	.187	—	—
t_2	—	—	.174	.185	.200	—	—
x	—	—	.531	.843	1.125	—	—
y	—	—	—	—	—	—	—

Unitrace-Duotrace Sizes	1 in.	1½ in.	2 in.		3 in.		4 in.		6 in.	8 in.
Product Area (in.²)	.64	1.68	2.72	2.36	6.38	5.67	10.84	9.74	24.64	42.79
Trace Area (in.² each)	.10	.16	.35	.22	.98	.61	1.86	1.07	2.85	5.12
Metal Area (in.²)	.65	1.03	1.39	1.46	2.28	2.46	3.24	3.53	7.05	10.60
Weight (lb/ft)	.77	1.22	1.66	1.72	2.71	2.89	3.85	4.16	8.38	12.60
*Min. Bend Radii (in.)	5	8	10½	10½	17	17	24	24	36	48
Wetted Perimeter (in.)										
Product	3.35	4.92	6.31	6.28	9.68	9.65	12.72	13.02	18.63	24.75
Trace (each)	1.49	1.71	2.40	1.87	4.13	3.22	5.32	4.23	6.75	9.63
Fitting Weights (lb)										
Trace-Caps	.102	.126	.240	.13	.464	.40	.674	.55	1.67	2.92
Elbows	.706	1.347	2.111	2.65	5.244	6.59	9.649	11.68	27.76	52.51
Impingement Plates	.024	.039	.057		.101		.162		.22	.34
Stub Ends				.65		1.50		2.13		
Terminal Casting				.50		1.12		1.75		

	1–2 in.	1½–2½ in.	2–3 in.	3–4 in.	4–6 in.	6–8 in.
Adapter Flanges	2.419	3.816	4.774	7.216	11.106	19.23

(Note: UNITRACE values are indicated in clear areas in the table above. DUOTRACE values are shown in the shaded areas.)
*Unitrace may be bent in any direction to these radii provided reasonable tooling is employed.

Aluminum Company of America, 867-H Alcoa Building, Pittsburgh 19, Pa.
Please send me the following literature covering Alcoa Aluminum for tubular products and other uses in the process industries:

- ☐ 10197 Aluminum Pipe and Fittings
- ☐ 10418 Alcoa Unitrace: Combines Piping and Tracing in One Unit
- ☐ 514 Alcoa Duotrace Technical Report
- ☐ 10270 Alcoa Utilitube
- ☐ 10460 Process Industries Applications of Alcoa Aluminum
- ☐ 11453 Solving Refinery Corrosion Problems with Aluminum
- ☐ 20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres
- ☐ 20437 Aluminum Alloy Heat Exchangers in the Process Industries
- ☐ 19416 Brazing Alcoa Aluminum
- ☐ 19415 Welding Alcoa Aluminum
- ☐ 19051 Alcoa Aluminum Handbook

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ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

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the handle to a $5200

Just one stroke of the handle stores the closing energy in the new and unique Federal Pacific 5 KV and 15 KV circuit breakers. By eliminating outside power sources, the new breakers cut installation costs up to $5200 on battery, cable and control requirements alone. And "stored energy" is *safe* energy with Federal Pacific breakers . . . even for inexperienced operators! Our exclusive foolproof interlock prevents actuation unless instrument door is *closed and locked.* Also available . . . electric motor charged "stored energy" breakers . . . for new economy and reliability in unattended installations.

saving!

Motor charged breakers can be manually operated in case of control power failure. This new line of breakers is just one more example of the outstanding products and ideas from Federal Pacific . . . famous for over fifty years of leadership in "stored energy" devices. For all the facts on Federal Pacific's complete line of "stored energy" circuit breakers, write for Bulletin 6045. Federal Pacific Electric Company, Department FP-2, Newark 1, New Jersey.

FEDERAL PACIFIC ELECTRIC COMPANY

FPE

growth through creative energy

Reporting more news from...

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...a fast-moving program of planned expansion, product development, and streamlined distribution to help our customers meet the competitive challenges of the Sixties.

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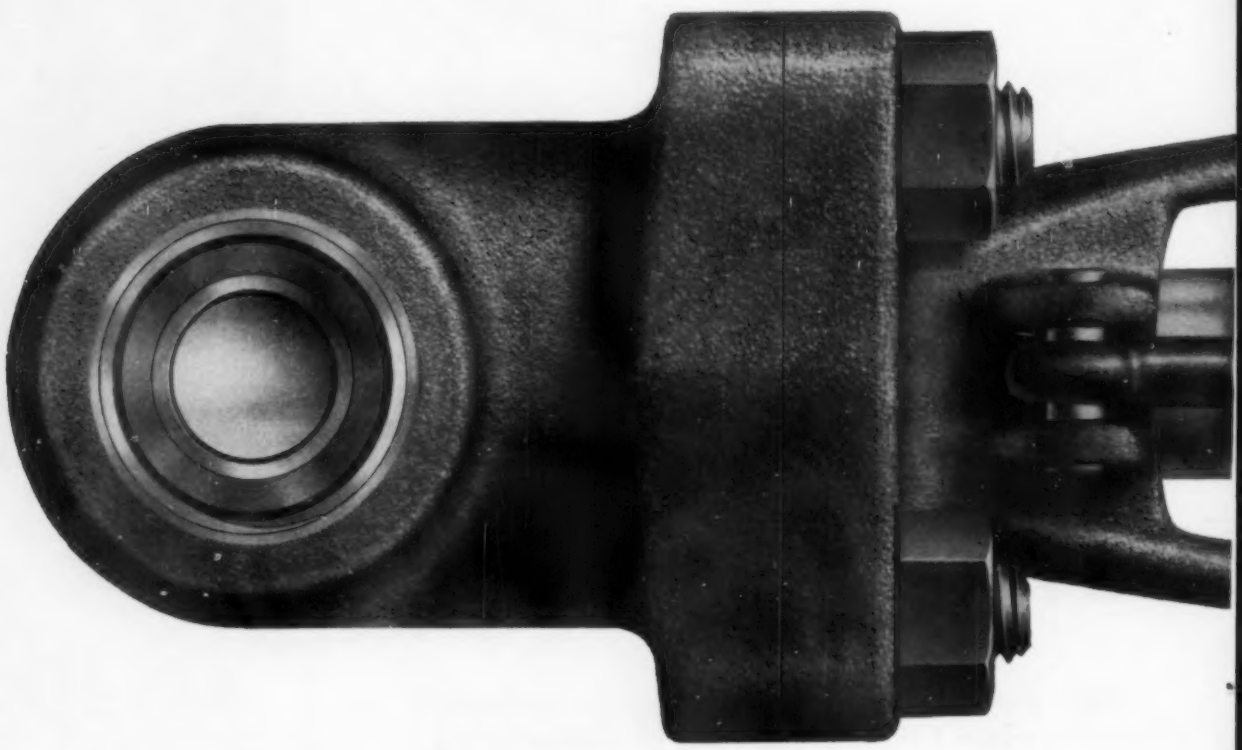
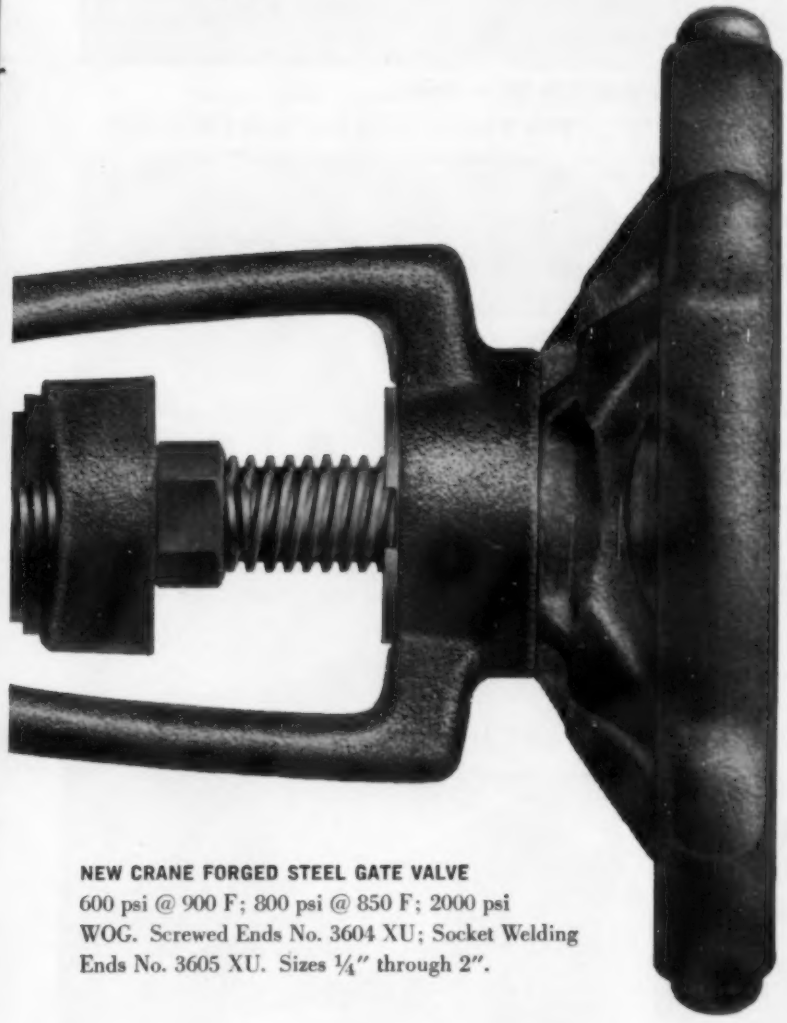


REDESIGNED!

THE NEW SMALL FORGED STEEL GATE VALVE



NEW CRANE FORGED STEEL GATE VALVE
600 psi @ 900 F; 800 psi @ 850 F; 2000 psi WOG. Screwed Ends No. 3604 XU; Socket Welding Ends No. 3605 XU. Sizes ¼" through 2".

This is a whole new valve, not just one with a new feature added. This redesign incorporates all the features you told us you wanted plus a few others we know will make this valve a better buy in terms of longer service life, less maintenance, easier and faster servicing.

Like the new "bow-leg" yoke, which for the first time gives you plenty of hand room for easy stuffing box maintenance. And like the long-life braided asbestos packing, with Inconel wire insert. The "universal" trim that can be used for either oil or steam, eliminating many of your stocking problems. The spiral wound stainless steel bonnet gasket with asbestos filler, made blowout-proof with a male-female joint.

But what we really want you to remember, more than any single feature, is that this Crane valve is the newest—all new—valve on the market... well worth considering when you need small, high-pressure steel gate valves. We'd like you to compare this new valve with any other comparable valve feature for feature.

Your local Crane distributor has technical literature and a complete selection of these valves right in stock. Call him on small steel gates. In fact, he's your best bet to call no matter what valve you want because he carries the broadest line of quality valves in the world.

CRANE®

CRANE CO., INDUSTRIAL PRODUCTS GROUP
4100 S. KEDZIE AVE. . CHICAGO 32, ILL.
VALVES • ELECTRONIC CONTROLS • PIPING
PLUMBING • HEATING • AIR CONDITIONING

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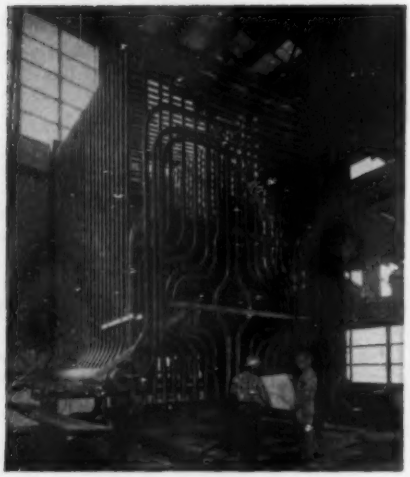

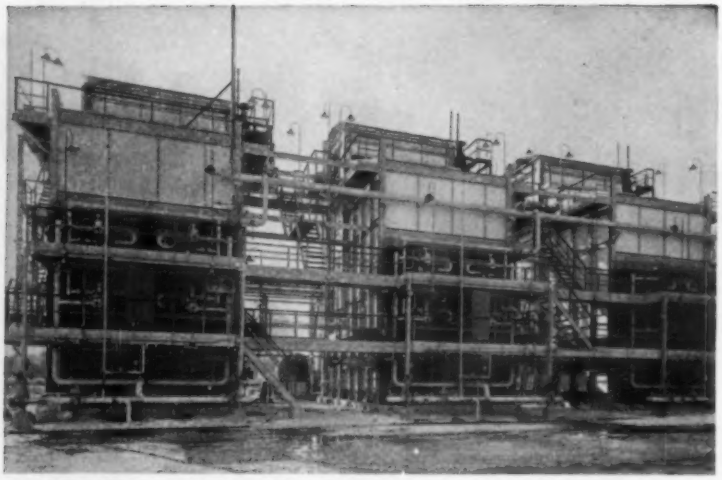

AT LEFT: Installing a 60,000 lbs/hr unit in a brewery

ABOVE: A battery of 125,000 lbs/hr units in a chemical plant

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Vogt engineering advances can save you money if you have a steam generating problem. Custom-built installations shown, are engineered to assure efficient, dependable steam generation for power, process and heating. Our engineering staff is available to give effective help in the solution of steam generating problems peculiar to a wide variety of operating conditions. Address Dept. 24A-8PLE.

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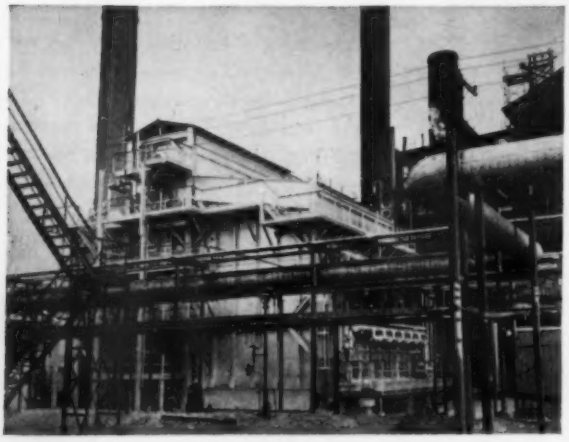

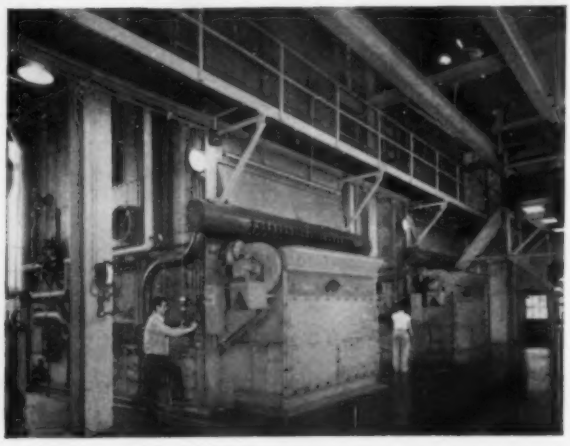

This 400,000 lbs/hr unit is installed in a leading petroleum refinery

Three 40,000 lbs/hr units serve a medical center

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BULLETINS just released and of immediate plant interest

PUMPS, COMPRESSORS

Progressing Cavity Pump—Characteristics and operation of the Moyno progressive cavity pump are detailed in 20-pp Bulletin 100. Includes engineering data and selection tables, product photos, dimension drawings and specifications. Moyno Pump Div., Robbins & Myers, Inc.
▲ For a copy, circle 101 on Post Card

Rotary Gear Pumps—Features and advantages of the Gearex Pump which employs the basic rotary gear principle to move liquid are detailed 6-pp Bulletin G-3. Cutaway view illustrates construction details and tables give dimensional data. Sier-Bath Gear and Pump Co., Inc.
▲ For a copy, circle 102 on Post Card

Rotary Vacuum Pumps—Features of company's oil sealed rotary vacuum pumps are detailed in 6-pp Bulletin 8-15. Discusses building block construction, ease of maintenance of these pumps, includes selection suggestions. Dimensions, physical specifications and data on speeds and capacities provided. Consolidated Vacuum Corp.
▲ For a copy, circle 103 on Post Card

Centrifugal Air Compressor—Twenty-pp Bulletin 175 introduces the Iso-Temp package centrifugal air compressor line for air separation plants and industrial use. In addition to detailed engineering data, brochure incorporates illustrations and descriptions of all major design features. Clark Bros. Co.
▲ For a copy, circle 104 on Post Card

PACKINGS, SEALS

Packing Chart—This packing recommendation wall chart shows proper types for specific applications. Suggests seven basic types for 95 per cent of all packing needs, including such applications as: pumps and valves, high-temperature valve stem and expansion joints, high-speed rotary air compressors, corrosive and viscous liquids, chemicals, gasket uses, hydraulic and pneumatic equipment. Raybestos-Manhattan, Inc.
▲ For a copy, circle 105 on Post Card

Cup Packings—Properties and characteristics of Rex-Syn cup packings—a combination of a plastic resin elastomer—are described in this bulletin. Gives standard sizes for Rex-Syn and outlines results of field tests. E. F. Houghton & Co.
▲ For a copy, circle 106 on Post Card

VALVES, TRAPS, FITTINGS

Bronze Gate Valve—Sectional views detail features of company's union bonnet bronze gate valve in Circular 610. Also included is a table of dimensions. Available in sizes ¼- to 2-in. This valve has a double wedge disc, rising stem, is rated 125 lb sp—200 wog. The Lunkenheimer Co.
▲ For a copy, circle 108 on Post Card

Ductile Iron Valves—Features and advantages of ductile iron non-lubricated plug valves with Teflon sleeves are detailed in 6-pp Bulletin V/12a. Cutaway view showing component features is included, along with specifications. The Duriron Co., Inc.
▲ For a copy, circle 109 on Post Card

Electrically Operated Valves—Described in 20-pp Bulletin 91024 are two, three- and four-way electrically operated valves. Includes descriptions, specifications, flow charts, ordering data. Airmatic Valve, Inc.
▲ For a copy, circle 110 on Post Card

Electric Check Valve—Described in 8-pp Bulletin W-10A is a double-cushioned electric check valve providing normal function with adjustable opening and closing speeds and fast emergency closing. Dimensional data, cross-sectional views and suggested wiring diagram included. Golden-Anderson Valve Specialty Co.
▲ For a copy, circle 111 on Post Card

Control Valves—Engineering and specification information on control valves of company's Venturi-ball design for all types of control and positioning equipment are presented in 16-pp Bulletin GV 101. Covers cast, barstock and special valves and includes illustrations and diagrams. General Kinetics Corp.
▲ For a copy, circle 112 on Post Card

Eccentric Valves—Eight-pp Bulletin 110 describes advantages of company's eccentric valves. Lists features, as well as materials, pressure ratings, dimensions, and accessories, and outlines areas of use. DeZurik Corp.
▲ For a copy, circle 113 on Post Card

Midget Solenoid Valve—Described in Folder 2142-3 are Midg-O-Matic Valves designed for small flow applications in equipment where space is limited. Detailed specifications are included, as well as flow capacity chart and solenoid electrical data. Hays Mfg. Co.
▲ For a copy, circle 114 on Post Card

Steam Traps—Eight-pp Catalog FE-310 provides information on low-cost bi-metal thermostatic and float thermostatic steam traps. Describes advantages and operation and includes complete specifications. MIL Div., Farris Engineering Corp.
▲ For a copy, circle 115 on Post Card

Thermostatic Traps—Construction and operation features of thermostatic radiator traps and float and thermostatic traps are illustrated and described in Bulletin 102. Includes diagrams, roughing-in dimensions and capacity tables. Sterling, Inc.
▲ For a copy, circle 116 on Post Card

Pipeline Strainers—Four basic types of pipeline strainers for condensate, steam, water, oil, air, gas and other piped fluids are covered in Bulletin 1210. Construction and operating features of strainers designed to protect steam traps, pumps, control valves, compressors and other equipment against dirt, scale or metal chips are detailed. Sarco Co., Inc.
▲ For a copy, circle 117 on Post Card

Steel Welding Fittings—How Husky welding fittings for schedule 40 piping are seven ways better is explained in 8-pp Catalog H-2. Illustrated with photos and dimensional sketches, gives data on concentric and eccentric reducers, elbows, straight and reducing tees. Also provided is comparison flow chart, information on performance, properties. Nibco, Inc.
▲ For a copy, circle 118 on Post Card

Thermal Insulation—This 16-pp bulletin is designed to serve as a guide to best use of thermal insulating materials under changing conditions of modern industry. It emphasizes "economic thickness" approach to specification, which enables determining point at which insulation gives greatest financial return. National Insulation Manufacturers Association.
▲ For a copy, circle 119 on Post Card

One-Piece Pipe Insulation—Thermal and physical characteristics of Mono-Kover one-piece pipe insulation are detailed in Baldwin-Ehret-Hill, Inc. Bulletin J-660. Gives application details. Baldwin-Ehret-Hill, Inc.
▲ For a copy, circle 120 on Post Card

FANS, BLOWERS, HEATING AND VENTILATING

Airfoil Bladed Fans—Features and advantages of centrifugal type airfoil bladed fans are detailed in 60-pp Bulletin A-1103. Includes cutaways showing wheel construction and two types of blade construction, as well as an illustrated discussion of modifications, data on methods of volume control, and capacity tables. American-Standard Industrial Div.
▲ For a copy, circle 121 on Post Card

Standard Blowers—Featured in Airfan Engineering Co. 26-pp Catalog STD-60 are standard blowers, including four-way discharge, twin assemblies, triple assemblies, utility sets, and cabinet blowers. Includes capacity tables, dimensional data and specifications. Airfan Engineering Co.
▲ For a copy, circle 122 on Post Card

Postage Free Cards for ordering bulletins are on pages 241-242. Be sure to include your name, job title, and company even if you want bulletins mailed to your home address.

Turbine Type Blowers—Bulletin 142C describes company's turbine type blowers for sewage treatment and other agitation applications in chemical, food processing and other fields. Includes installation photos and application data, typical job specifications. The Spencer Turbine Co.
▲ For a copy, circle 123 on Post Card

Air Handling Unit—Featured in this product bulletin is an industrial ventilating heating and conditioning unit for use in a variety of industries.

BULLETINS

(Begins on page 23)

Typical installations are given, as well as physical data and specifications. The King Co. of Owatonna.
For a copy, circle 124 on Post Card

Industrial Ventilators—This 20-pp guide for better air control is designed to help industrial users determine type ventilation equipment for specific needs. The guide matches design features with ventilation requirements and special conditions, controlling efficiency, and economy, and includes performance and dimension charts. The Loren Cook Co.
For a copy, circle 125 on Post Card

Heating, Ventilating Units—Illustrated and described in this 24-pp bulletin is the Seasonvent line of heating and ventilating units. Includes detailed information on sizes, capacities, applications, together with dimensional and arrangement data and engineering specifications. McQuay, Inc.
For a copy, circle 126 on Post Card

For Industrial Ventilating—Illustrated and described in this product bulletin is industrial ventilating equipment for use in corrosive atmospheres. Includes performance data as well as information on special corrosion-resistant materials and coatings for use on industrial ventilating equipment. Hartzell Propeller Fan Co.
For a copy, circle 127 on Post Card

DUST CONTROL

Dust Collector—Operating principle and construction features of a reverse jet fabric dust collector are detailed in 8-pp Bulletin 279C. Includes application and size data. American Air Filter Co., Inc.
For a copy, circle 128 on Post Card

Dust Separators—Illustrated and described in 8-pp Bulletin D-20 are dust separators utilizing basic principles of dust separation by cyclonic action. Includes performance data, installation photos, selection and dimension charts. The Day Co.
For a copy, circle 129 on Post Card

CONSTRUCTION

Metal Partitioning—Eight-pp Catalog 6015 describes metal partitioning for all types of enclosures. Includes installation diagrams and discusses features, advantages. The Globe Co.
For a copy, circle 130 on Post Card

Versatile Building Panels—Bulletin IC-260 illustrates typical applications of Alsynite translucent reinforced fiberglass building panels. Lists data on various high light-transmission panels, flat panels, specification and installation. Alsynite Div., Reichhold Chemicals, Inc.
For a copy, circle 131 on Post Card

Decorative Protective Panels—Advantages of Security Panel, a combination of steel mesh and polyester resin translucent panels, is detailed in this bulletin. It features high dimensional stability, high impact strength and protective functions. Installation and technical information are covered. Resolite Corp.
For a copy, circle 132 on Post Card

Inspection Door—Eight-pp Manual 54-7 describes an access door designed for concealing and giving access to mechanical and electrical controls. Illustrated are typical installation areas, tips on proper installation in varied wall and ceiling materials, and engineering dimensions and data. Zurn Industries, Inc.
For a copy, circle 133 on Post Card

Concrete Curing Compounds—Featured in this product bulletin are concrete curing compounds, 100 per cent resin base, white pigmented, and wax-resin base types. Covers advantages, uses, specifications. A. C. Horn Companies, Div., Sun Chemical Corp.
For a copy, circle 134 on Post Card

STORAGE EQUIPMENT

Improved Storage Rack—Features and advantages of company's storage rack—a free-standing unit engineered to support solid loading in each compartment—are described in this product bulletin. Typical installations are illustrated. Abell-Howe Co.
For a copy, circle 135 on Post Card

On Storage Racks—Advantages of engineered racking are outlined in this 28-pp catalog on problems of materials storage. Discusses price of improper storage rack design, reasons for rack failure; shows how these racks cut costs. The Paltier Corp.
For a copy, circle 136 on Post Card

Steel Shelving—Catalog 2400 contains 36 pp of information on steel shelving, including boltless T-line shelving, angle shelving, tool storage inserts, drawer case units, bin units, custom shelving arrangements and truck shelving, steel lockers, storage cabinets and bookcase shelving. Illustrates typical installations, includes specifications. Penco Div., Alan Wood Steel Co.
For a copy, circle 137 on Post Card

MATERIALS HANDLING

Hoists, Trolleys and Cranes—Eight-pp Bulletin DH-28A describes design and operation of motor-operated hoists and trolleys, electric chain hoists, hand-operated hoists, jib cranes, hand-travelling cranes, other equipment. Includes general specifications. Wright Hoist Div., American Chain and Cable Co., Inc.
For a copy, circle 138 on Post Card

Truck Safety Aids—Again available to plant engineers is a safety kit aimed at promoting correct operating procedures related to use of fork lift trucks. Contains pocket-sized operator's guide; four safety cartoons for bulletin board posting; four lift truck route posters—each with a message of caution regarding narrow aisles, blind corners, dangerous crossings and low headroom areas. The operator's guide shows proper techniques for lifting, transporting and stacking. Towmotor Corp.
For a copy, circle 139 on Post Card

On pages 241-242 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in the ads.

Industrial Truck Costs—A library of information on figuring industrial truck costs is presented in four recently published bulletins—62 pp in all. Includes factual industrial truck cost histories and do-it-yourself formulas for quick, accurate calculation and comparison of all expenditures in owning, operating and maintaining trucks powered by electricity, gasoline, propane. Exide Industrial Div., The Electric Storage Battery Co.
For a copy, circle 140 on Post Card

Lift Trucks—Eight-pp Catalog BU-640, with attached specification sheets BU-641, 642 and 643, describes features and advantages of company's lift trucks. Engineering specifications, performance and operating data included. Allis-Chalmers Mfg. Co.
For a copy, circle 141 on Post Card

Electric Fork Truck—Dimensional and engineering specifications and operational advantages of a 2500-lb capacity battery powered fork truck are presented in 6-pp Bulletin SS-2215. Features of truck are illustrated and detailed. Clark Equipment Co.
For a copy, circle 142 on Post Card

Truck Power Unit—Features and operating advantages of company's Ready-Power units for use on any make electric truck are detailed in 12-pp Bulletin 99A. Illustrations of typical truck installations are included, as well as recommendation chart for electric trucks. The Ready-Power Co.
For a copy, circle 143 on Post Card

Industrial Tractor Shovels—Applications of tractor shovels in a variety of industries are pictured and described in 8-pp Form 304. Detailed specifications are included. The Frank G. Hough Co.
For a copy, circle 144 on Post Card

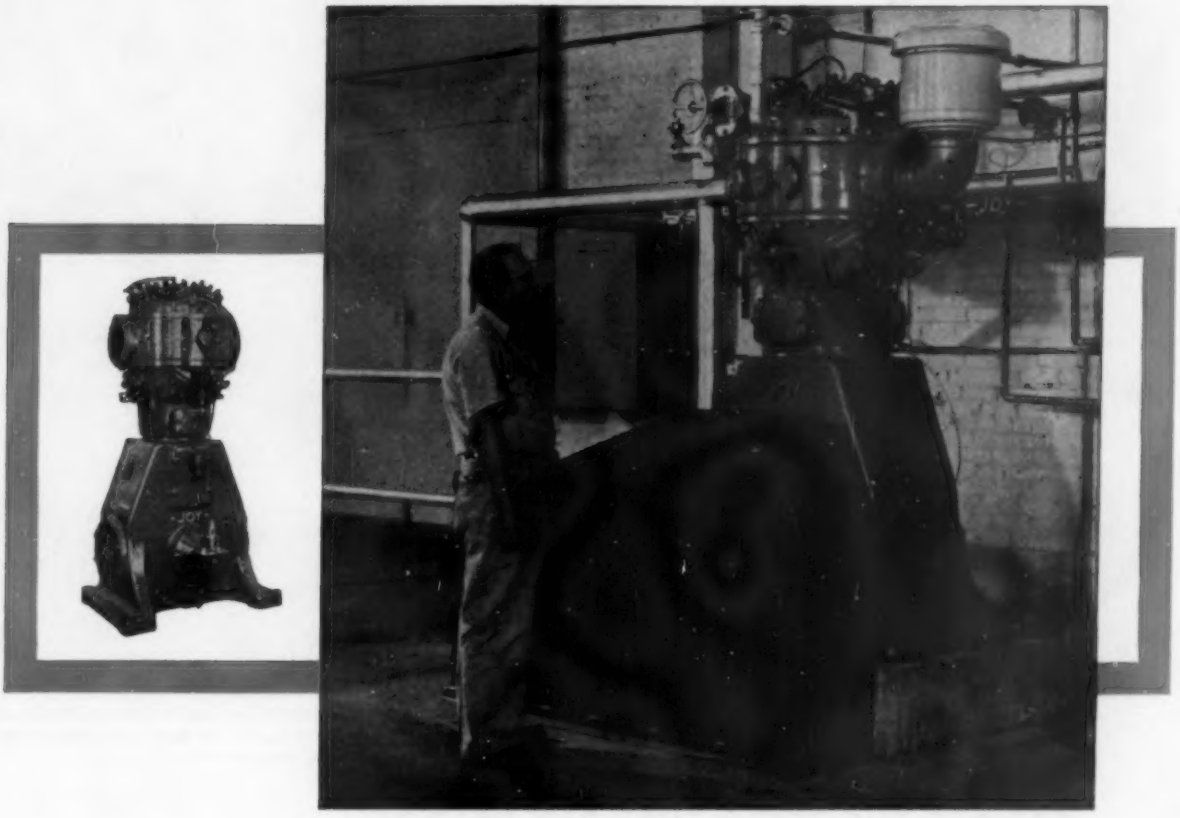
Mechanical Jacks—Mechanical Catalog 60 contains 16 pp of information on mechanical jacks and pullers, including ratchet lowering lever jacks, track jacks, journal, bridge, screw, push-and-pull jacks, special purpose equipment, accessories. Includes specifications. Templeton, Kenly and Co.
For a copy, circle 145 on Post Card

Fibre Handling Products—Illustrated and described in two recently published bulletins is company's entire line of fibre products. One catalog covers Fedco Tough Babies—mill, tote and conveyor boxes and fibre trucks for materials handling. The other describes Fiberok Tough Babies—baskets, utility cans, heavy duty cans and round corner receptacles for waste handling. Federal Fibre Corp.
For a copy, circle 146 on Post Card

(More Bulletins on page 243)

Now Available Up To 150 HP

NEW JOY WG9H VERTICAL COMPRESSORS



Joy's line of highly efficient vertical type compressors has been extended to 150 hp. These new heavy duty WG9H's have the same design features which established the vertical type, single-cylinder compressor's reputation for high efficiency and low maintenance.

You can get both standard and oil-free machines in six standard atmospheric air sizes, with appropriate cylinders for gas boosting and high pressure applications, if desired. Capacity range is from 633 to 1630 cfm.

Other Joy vertical type compressors are available in a range from 15 to 75 hp. Joy also can furnish V-type and semi-radial type machines up to 1250 hp, and axial or centrifugal compressors from 15 to 15,000 hp. Whatever your air or gas compressing problems may be, Joy can supply an economical solution.

For full information on the new line of WG9H Compressors, write for Bulletin 1013-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For more facts circle 516 on Reply Card

MOVIE: "STOP LOSS WITH ORGANIZED LUBRICATION," a new 20-minute color-and-sound film created to show the opportunities for cost control through Organized Lubrication.

EDUCATIONAL FILM PACKAGE for plant departments consists of movies on greases, hydraulic oils, cutting oils, etc., that may be selected after seeing the "Stop Loss" film.

HERE ARE THE TOOLS THAT CAN HELP YOU

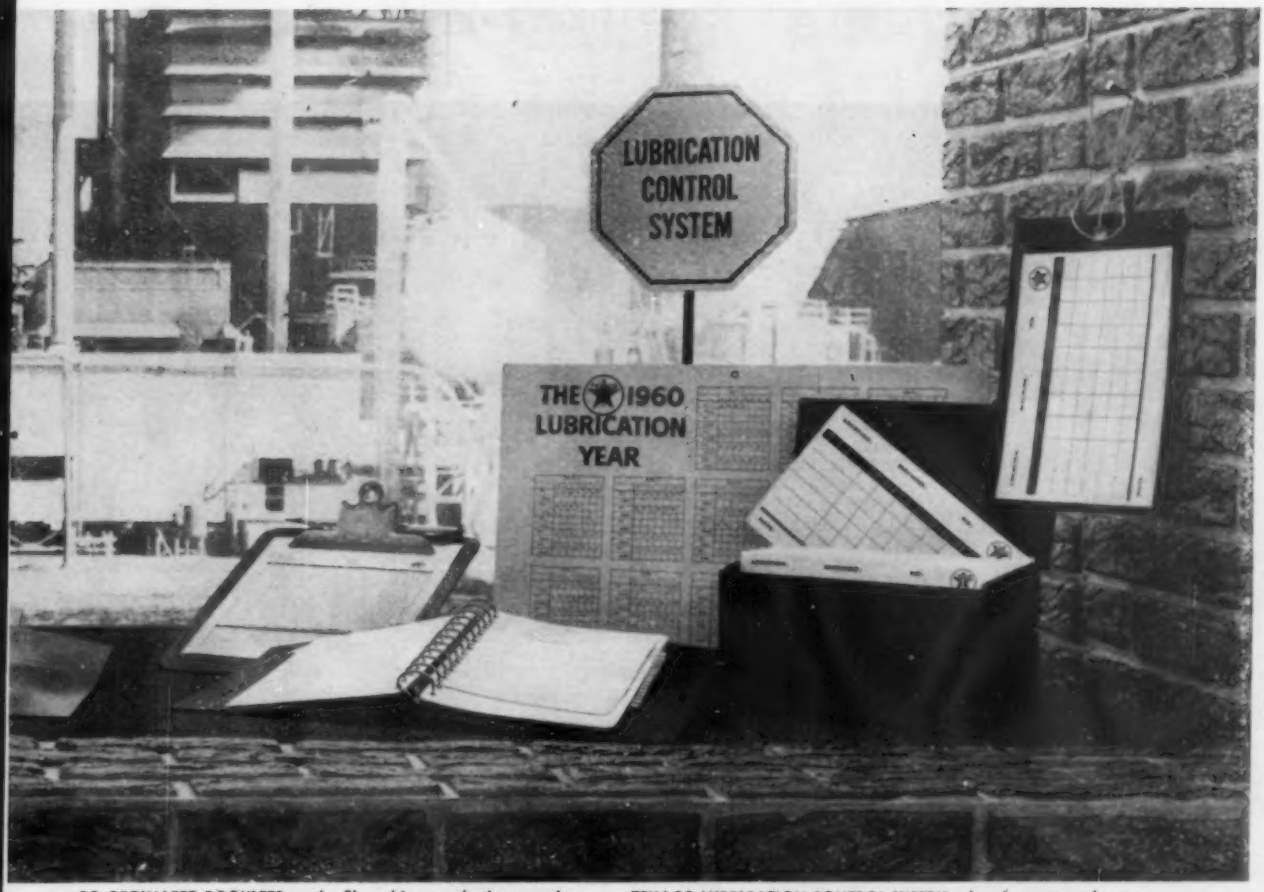
INCREASE YOUR NET PROFITS

Texaco's new "Stop Loss" program is designed to cut maintenance costs by modernizing lubrication practices. If yours is an average plant, the results can add 4 per cent to your net profit.

Even if your plant is an efficient operation, it is still virtually certain that there is an opportunity for cost control you are overlooking—either partially or completely. Here's what the Small Business Administration says in a recent publication:

Suppose there is an average plant, which sells $1,000,000 worth of goods per year. The net profit of this average company would be $73,400 and the maintenance cost would be $29,900. Now, suppose that by *better lubrication*, maintenance costs are reduced 10%, or $2990, *the $2990 will go directly into profit*—an increase of 4%.

A Texaco "Stop Loss" Program is designed for you. Texaco has developed a program specifically designed to help cut your maintenance costs via better lubrication practices. It will help you increase machine life, minimize downtime, reduce lube inventory, even cut purchasing costs. And the savings you make go directly into profits.



CO-ORDINATED BOOKLETS on the film subjects and others can be used as guides in specific areas.

TEXACO LUBRICATION CONTROL SYSTEM takes the guesswork out of your lubrication scheduling. It costs almost nothing to install, yet can add thousands of dollars a year to profits.

BY AS MUCH AS 4 PER CENT!

Can your plant pass this test? If the answer is "no" to any of the following questions, it is almost certain that a Texaco "Stop Loss" Program can improve your profit picture.

1. Is there a central source of responsibility in your plant for *all* lubrication? Yes ☐ No ☐
2. Can your machine operators devote all their time to production without worrying about lubrication? Yes ☐ No ☐
3. Is there any system for making sure that equipment gets lubricated in the right spots at the right time? Yes ☐ No ☐
4. Have you had a lubrication study made to eliminate costly duplication of lubricants? Yes ☐ No ☐
5. Are your oilers qualified men with knowledge of mechanisms lubricated? Yes ☐ No ☐

See for yourself how "Stop Loss" works! Texaco has just released a new color-and-sound movie to dramatize the benefits of good lubrication practices. It's called "Stop Loss through Organized Lubrication" and we think it would be valuable to you to see it. For a showing in your plant soon, mail in the coupon today!

Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

MAKE YOUR RESERVATION TODAY!

TEXACO INC., Dept. E-160
135 East 42nd Street
New York 17, New York

I would like to see "Stop Loss through Organized Lubrication." Please call to arrange a showing in my plant.

Name_____ Title_____

Firm_____

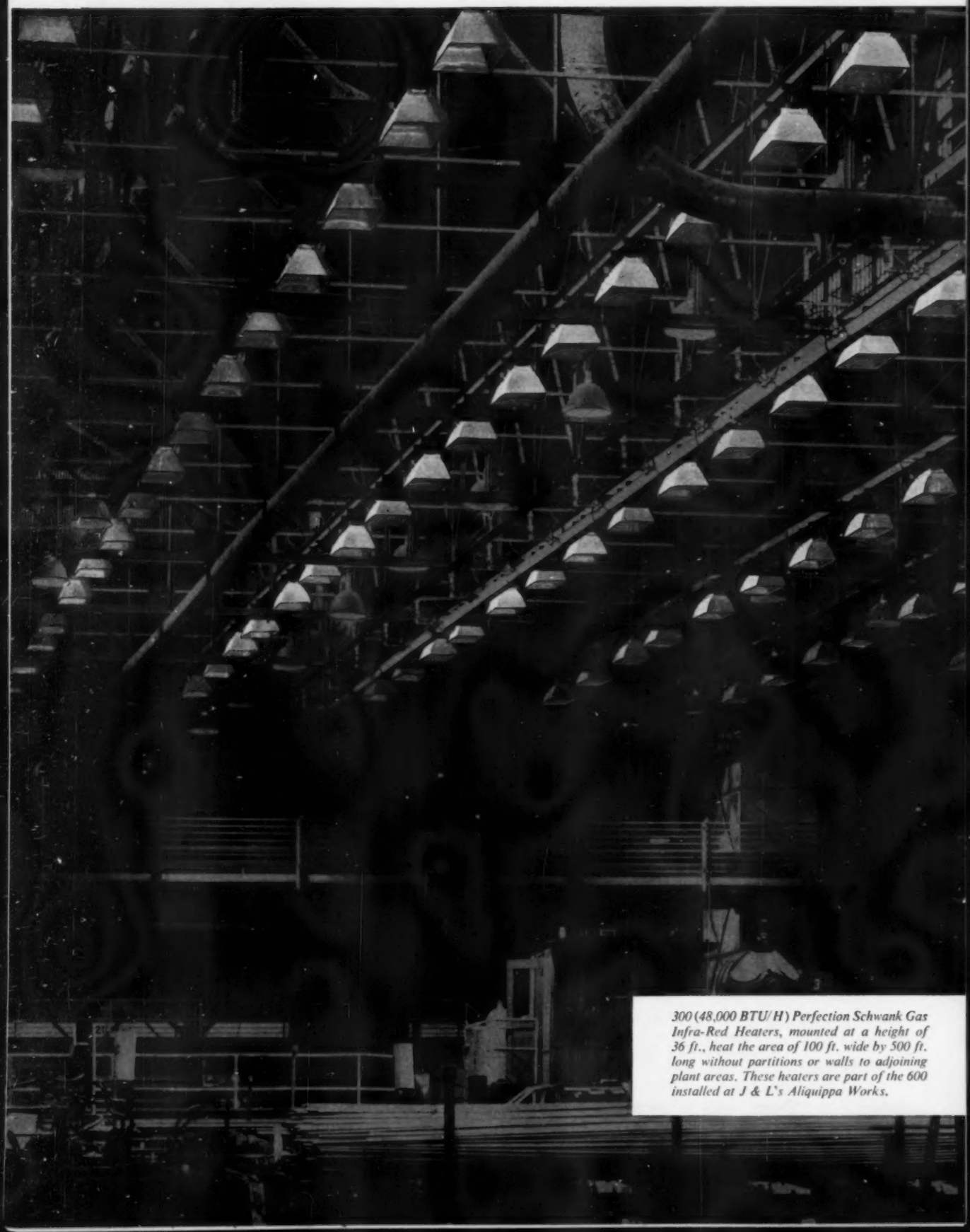
Address_____

City_____ Zone____ State_____

TEXACO

For more facts circle 517 on Reply Card

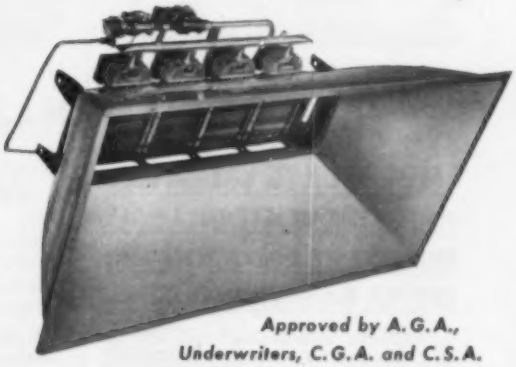
PERFECTION



300 (48,000 BTU/H) Perfection Schwank Gas Infra-Red Heaters, mounted at a height of 36 ft., heat the area of 100 ft. wide by 500 ft. long without partitions or walls to adjoining plant areas. These heaters are part of the 600 installed at J & L's Aliquippa Works.

SCHWANK Gas Infra-Red Heaters...

Meet J & L's Critical Heating Requirement... Save 46% in BTUs



Approved by A.G.A., Underwriters, C.G.A. and C.S.A.

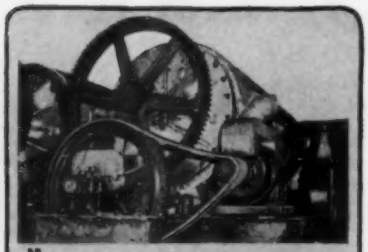
Minimum 55° machinery temperature is necessary to guarantee peak operating efficiency of critical production equipment at Jones & Laughlin's No. 1 Continuous Weld Pipe Mill, Aliquippa, Pa. Replacing inefficient, costly and dirty salamanders, 300 Perfection Schwank Gas Infra-Red Heaters (600 in the entire plant) meet this tough requirement with a BTU capacity 46% *less* than any other proposed heating system. Total maintenance requirements consist of air blowing the units once each heating season. And, after three full seasons of dependable heat and employee comfort, not one of the 2,400 ceramic burners (4 per heater) has ever needed replacement. No wonder there are over 25,000 enthusiastic users of Perfection Schwank Gas Infra-Red Heaters.

PERFECTION 1135 Ivanhoe Rd., Cleveland 10, Ohio

division of **Hupp Corporation** / licensee of **American Infra-Red Radiant Co.**

PIONEERS IN GAS INFRA-RED HEATERS

Under Schwank U.S.Patents 2,775,294 and 2,870,830 and pending applications



"THIS LUBRICANT INCREASED CHAIN LIFE 4 TIMES"

—says FASTERFAT, Division of National Sea Products Limited

"Two years ago we switched from the lubricant we were then using to your LUBRIPLATE, and we are pleased to inform you that we have had very excellent satisfaction from its use. High speed silent chains on the drives of our fish meal cookers, which were formerly worn out in about six months, are still in service after two years."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 519 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Upgrading Maintenance Craftsmen

PLANT ENGINEERING:

"I am interested in obtaining sample examinations for the various maintenance department crafts, namely millwright group leader, millwright, mechanical repairman, maintenance helper, electrician, boiler operator, carpenter, painter and toolkeeper.

"In order to upgrade my present force and advertise vacancies for maintenance work in the company, I would like to establish examinations to determine individual ability and aptitude along with the practical work." *Andrew G. Szendrey, Maintenance Supervisor, J. Bishop & Co., Malvern, Pennsylvania.*

► Names of several sources of the type of information our correspondent is seeking, have been sent to him. Readers who have found suitable material might like to get in touch with Mr. Szendrey direct.—*Editors.*

Lightning Protection

PLANT ENGINEERING:

"Your article in the June, 1960 issue 'Is Your Plant Protected if Lightning Strikes,' was one of the best treatises for lightning protection on plants ever written.

"Would you kindly hold the plates and quote us on reprints of: 1000, 2000, 3000, 5000, and 10,000 with a copy of the letter going to Ernest C. Cripe, President, Independent Protection Co., Inc., Goshen, Ind., as well as the Lightning Protection Institute, 53 W. Jackson Blvd., Chicago, Ill.

"Also, if you can spare a sample June copy to each of us it will be appreciated." *Howard L. Hutchins, Electra Protection Company, Inc., Albany, New York.*

► Quotations for reprints have been sent to Mr. Hutchins. Tear sheets of the article he mentions are still available to readers.—*Editors.*

Welding Methods and Equipment

PLANT ENGINEERING:

"Your October, 1959 edition carried a very interesting series with regard to welding by Mr. John J. Chyle, of A. O. Smith Corporation.

"We are fabricators of Type 302 stainless steel material and are quite interested in recent welding advances in this field. Distortion being a major consideration, we are especially interested in the foil seam welding and also in the brazing which we understand is referred to as nitro-brazed.

"We would appreciate any information that you might supply." *Don Temple, Engineering Dept., Zero Mfg. Co., Washington, Mo.*

► A baker's dozen of welding processes, both in use and in development, were described in our October issue. The article was "Welding—What Is Here, What Is Ahead." We have put our correspondent in touch with the author who is Director of Welding Research for the A. O. Smith Corp. of Milwaukee, Wis.—*Editors.*

Pneumatic-Hydraulic Service

PLANT ENGINEERING:

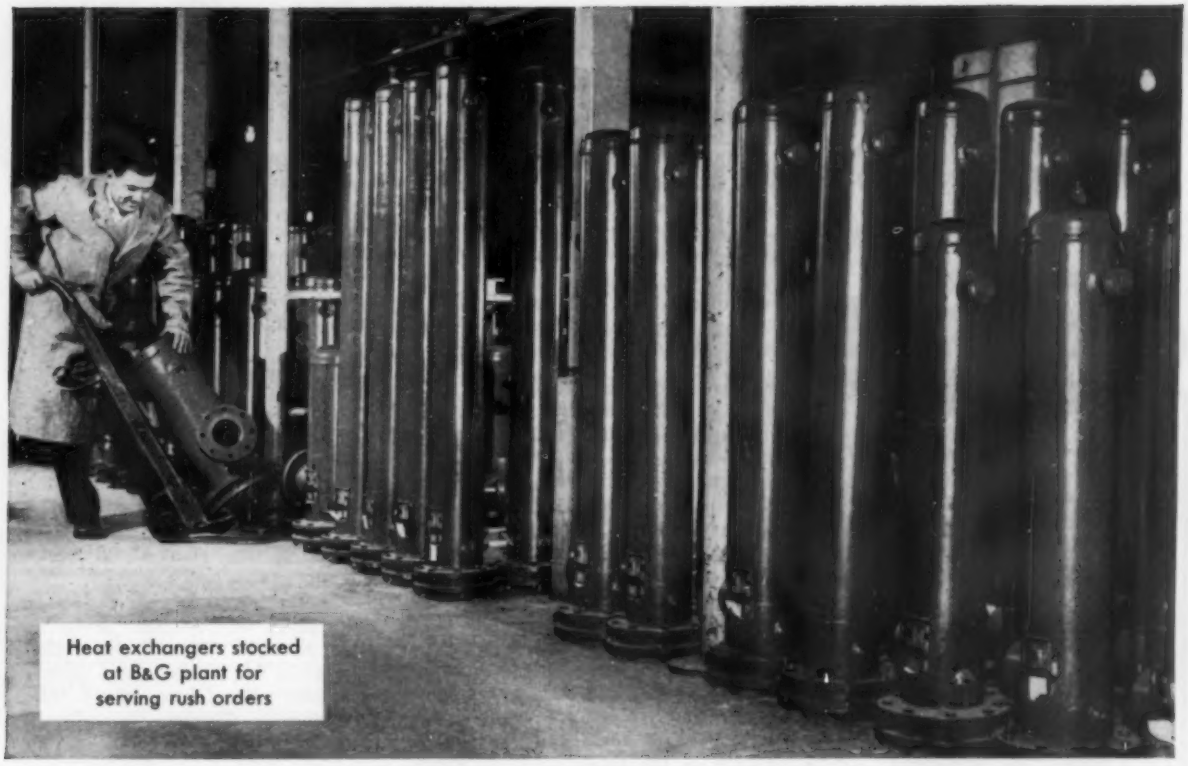
"We have followed with interest your series of articles on pneumatic and hydraulic actuation systems, but feel compelled to comment on some of the statements made in part four, published March, 1960.

"The statement recommending that direct-acting solenoid valves not be considered for high cycling operations is quite misleading. The development of the lapped spool and floating sleeve valving action, without any dynamic seals and the further development of shock mounted solenoids, has eliminated the problem of solenoid breakage in direct-acting valves.

"The second item is the mention that where long holding periods are required, it is not desirable to use these valves. Virtually all solenoids used on industrial valves today are capable of being held indefinitely without injury to the coil, regardless of size of the solenoid.

"A second pointer to consider is that most of the pilot valves in solenoid controlled, pilot-operated valves today are of the three-way type which were designed specifically to be cooled by the passage of pilot air through the center of the coil and around the solenoid plunger-poppet. When they are used on continuous hold, there is no constant passage of pilot air and while the coils themselves do not burn out, the heat generated creates problems with the sealing material used in the poppet seat. In short order they deteriorate and leak.

"We realize of course that treading



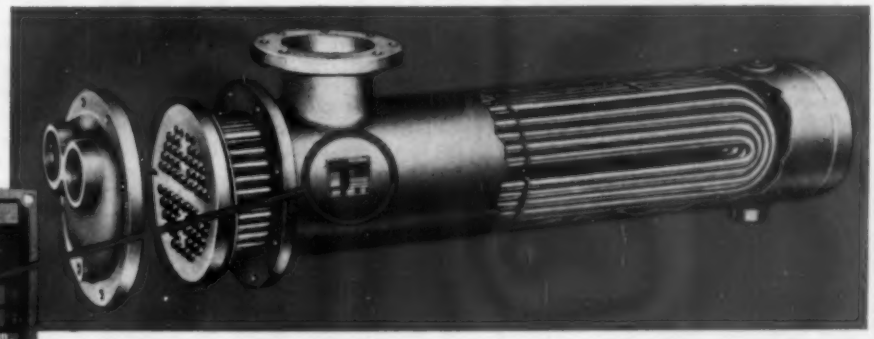
Heat exchangers stocked at B&G plant for serving rush orders

NEED A HEAT EXCHANGER IN A HURRY?

All facilities for heat exchanger manufacture are available under one roof at the B&G plant, where assembly line procedures permit building an inventory of stock parts and complete units. B&G Heat Exchangers are not only engineered to top efficiency but are constructed to the highest standards of quality and safety as required by the A.S.M.E. Unfired Pressure Vessel Code. Form U-1 Manufacturers' Data Report for Unfired Pressure Vessels is furnished with each unit as required by the provisions of the A.S.M.E. Code.

B&G Heat Exchangers are made in both U-bend and straight tube, floating tube sheet models. A comprehensive stock of U-bend exchangers is available for fast shipment. Refrigeration condensers, evaporators, liquid receivers and suction line heat exchangers are also maintained in factory stock.

Send for brochure "The A.S.M.E. Story"



All B&G Heat Exchangers are stamped with A.S.M.E. "U" Symbol

BELL & GOSSETT COMPANY

Dept. GH-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

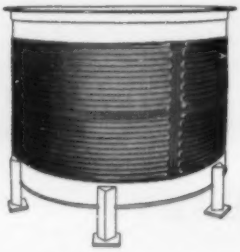
For more facts circle 520 on Reply Card

HEAT YOUR TANK THE MODERN LOW COST WAY

with superior

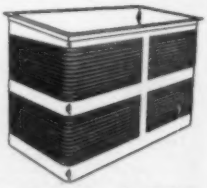
DEAN® PANELCOIL

Regardless of your operation or the size or shape of your tank, if it is to be heated or cooled, Dean Panelcoil can do the job more economically and more efficiently than old-style pipe coil or jacketing.



Open Cylindrical Tank

- Sturdy, Lightweight Construction for Long Operational Life.
- Easy to Remove Panelcoil for Cleaning or Replacement.
- Available in standard single and double embossed Panelcoil, in widths from 12" to 29"; in lengths from 23" to 143" flat or rolled to size to fit any tank. Standard Panelcoil made in "L"-grade carbon steel and type 316 "L" stainless steel. Also in Monel, Carpenter 20, Nickel, Hastelloy, Nionol and Titanium — up to 14-gauge for embossed stainless Panelcoil.



Open Rectangular Tank

- Easy to Calculate — Engineering cut to minimum with Dean's complete engineering data file.

For Complete Data — Write for Data Sheet 15-60 Series, and Price Bulletin 259.

Enclosed Cylindrical Tank

DEAN PRODUCTS, INC.
1047 Dean Street, Brooklyn 38, N. Y.
STerling 9-5400

Backed by 25 Years of Panel Coil Manufacturing

For more facts circle 521 on Reply Card

BACKTALK— FORETHOUGHTS

the middle of the road editorially and yet giving accurate information to your readers is a difficult job. In the main, the articles are very well written and there is little to argue with from the technical standpoints. However, we felt that these comments were in order to set the record right." *George Doig, Sales Manager, Numatics, Inc., Highland, Mich.*

► The author's reply follows:

"I read with interest your letter to the editor of PLANT ENGINEERING. In covering an article we must consider the complete range of sizes. In my experience over the past 18 years in servicing and engineering fluid power equipment, I have seen many direct-actuated solenoid valves fail due to mechanical failures of the larger solenoids.

"I have witnessed failures where rivets would shear, wear plates would break and solenoid coils would burn out. Granted, many solenoid coils burned out because of mechanical failure in the larger solenoids themselves.

"Until a few years ago, large four-way hydraulic valves were actuated by direct-acting solenoids and the valve plungers were slammed very hard. With the advent of the 'piggy back' four-way valves, one sees very few direct-actuated valves in use.

"As for continuous duty solenoids, I have seen many that were rated such, burn out and they were made by reputable manufacturers. I feel that if you would poll a cross section of users of all sizes of pneumatic and hydraulic valves, you would find much complaint regarding the large direct-actuated solenoid control valves. You will find that many users carry quite a supply of solenoid coils and spare parts to take care of failures.

"I really appreciate your letter and like your constructive criticism. I feel that it helps all of us."

Fire-Retardant Paints

PLANT ENGINEERING:

"Thank you for sending us so promptly the tear sheets of the article on fire-retardant paints by Kenneth Dopp, plant engineer at Bell & Gosset Co., Chicago, Ill. This was published in the November, 1959 issue of PLANT ENGINEERING. We have reproduced it as Federation Bulletin No. 60-16 and sent it to all members of the Federation of Mutual Fire Insurance Companies, an association allied with ours. The bulletin will have wide distribution since the members are located coast-to-coast.

"Of particular interest in the article is the contention that since flame-retardant paint tends to retard fire spread over ceiling surfaces, the number of sprinkler heads that might open from any one fire is also thus restricted. All this tends to reduce water damage, an important consideration of property insurance companies." *(Mrs.) Evelyn Becker, Librarian, American Mutual Insurance Alliance, Chicago, Ill.*

PM for Industrial Trucks

PLANT ENGINEERING:

"We are interested in scheduling a maintenance and lubrication program for our material handling equipment, such as gasoline powered lift trucks, front end loaders. Also included in this plan would be our electric motors and blowers.

"In the past issues of PLANT ENGINEERING, we have seen some suitable examples of just such charts illustrated and we wonder if these are available." *Ben Chase, Inland Metals Refining Co., Chicago, Ill.*

► Tear sheets of " 'Engineered' Maintenance Is Better, 10 Ways," and "Industrial Maintenance" have been sent to Mr. Chase. We think these articles will help him.—*Editors.*

Wants Catalog Filing System

PLANT ENGINEERING:

"In past issues of your magazine I have seen some very interesting articles relating to methods used to set up various types of maintenance schedules. However, in line with this type of article, I would like to know if there has been, or will be any articles relating to a good engineering catalog and data filing system.

"The primary problem with our existing system is the categorical breakdown of items. We have tried alphabetical listing, with limited success. Questions arise when looking for items in the Index Book as to which letter category it is filed under.

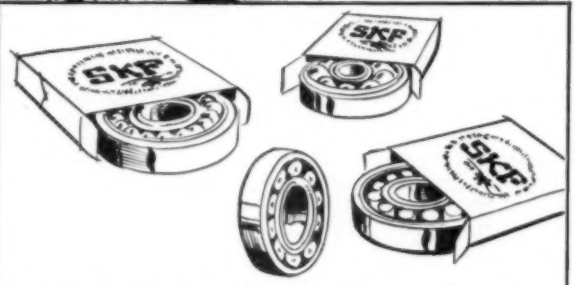
"We would sincerely appreciate any help you could give us concerning this problem, in the form of reprinted articles or a notification of any future publications which would help us." *Frank Laureanno, Jr., Engineering Department, Globe Manufacturing Co., Fall River, Mass.*

► An article on special filing systems for catalogs, magazine articles and so on, is planned for an issue in the near future. Meanwhile, if readers have found a practical way to file catalogs, we believe Mr. Laureanno would be pleased to hear from them.—*Editors.*

DISTRIBUTOR DAN, the SKF bearing man, shows

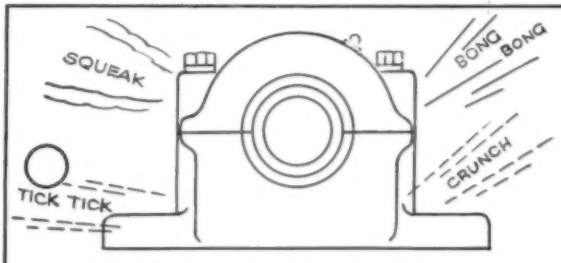
HOW TO CHECK BEARINGS DURING RUN-IN

—to prevent damage and downtime later!



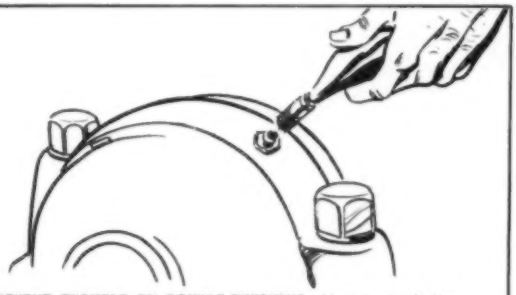
THINK BEFORE YOU INSTALL THEM. The first few hours of operation are the most critical in a bearing's life. So, operate the bearing at reduced speed and load during run-in. Bearing run-in periods vary from a few hours to a few weeks, but 24 hours is usually sufficient.

NOISE CAN BE A SYMPTOM. A soft, purring sound is all you should hear from a bearing—if it's operating correctly. Check by placing the blade of a screwdriver and listening at the handle. Any other noise means trouble sooner or later.



KNOW YOUR NOISES. Squeaking means inadequate lubrication. Metallic tones indicate shaft or housing interference or improper adjustment. Smooth, clear tones tell of marks in the stationary raceway. Intermittent noises indicate a damaged ball. Crunching means dirt.

TOO HOT TO HANDLE? There's trouble brewing if the housing feels excessively hot. High temperature usually indicates overlubrication or use of a lubricant with too high viscosity. It can also be a sign of excessive axial or radial preloading, misalignment, tight-fitting seals, or rubbing.



PREVENT TROUBLE BY DOUBLE-CHECKING. Always check the bearing after the critical run-in period. Examine the lubricant. If it's dirty, change it. Check the seals for signs of wear or damage. A few minutes spent double-checking now eliminates chances of costly damage and downtime later.

Baffled by a bearing problem? Whether it's selection, mounting or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

SKF

AUTHORIZED DISTRIBUTOR

6018

Spherical, Cylindrical, Ball, Toron® Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

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For more facts circle 523 on Reply Card →

Speedy, safe Yale electrics

make loading, dock handling and warehousing quicker, easier, less expensive for you. Special features of these end-control electrics include high lifting speed, a turning radius so short that the truck can turn within an inch of its own length and a low step for easy on-and-off operation. A choice of controls is available, specially designed to suit a wide variety of operations. Choose the one that suits your applications best—they all protect fragile loads. Interlocking I-beam mast construction prevents edge-to-edge wear and strain. Economy of operation is assured because of efficiency of handling and long life of the equipment. Capacities: 2000 and 3000 lbs. Yale's new end-control electric is just one truck in the most complete line of industrial lift trucks and hoists manufactured today. For more information contact your Yale representative or write to The Yale & Towne Manufacturing Company, Materials Handling Division, Philadelphia 15, Pa., Dept. KT8.

Yale Materials Handling Division, a division of The Yale & Towne Manufacturing Company. Manufacturing Plants: Philadelphia, Pa., Forrest City, Ark. Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks · Worksavers · Warehousers · Hand Trucks · Industrial Tractor Shovels Hand, Air and Electric Hoists.

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INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS · HOISTS

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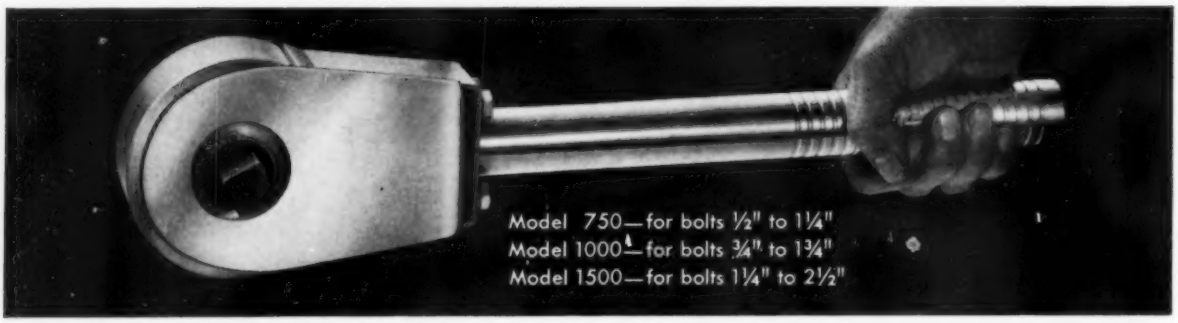
designed to solve a universal maintenance problem . . .

first manual impact wrench that works . . . LOOSENS THE TOUGH NUTS EVEN POWER WRENCHES CAN'T BUDGE!

SWENCH®



• Loosens "frozen" nuts in seconds • Tightens nuts to maximum practical tightness

There's never been anything like Swench before. It is an entirely new concept in wrench design. Swench is the world's *only manual impact wrench.* Here's what Swench means to you . . .

NEW SPEED—Nuts that previously had to be burned off can now be "Swenched off"—with unbelievable ease—by *one* man—in a matter of minutes.

NEW EASE—Only Swench in its torque class is truly portable . . . lets you take the wrench to the job—*anywhere*—with no auxiliary equipment, no power connections.

NEW SAFETY—With Swench there's no back-breaking, knuckle-knocking struggle . . . no dangerous handle extensions . . . no sudden release of a frozen nut . . . no shock transmitted through the handle.

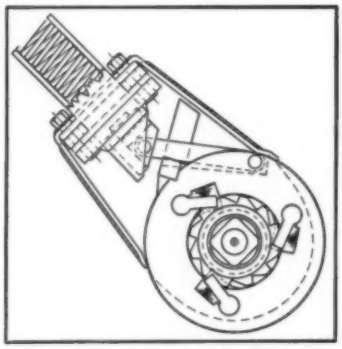
See for yourself! Swench is so different from anything you've experienced, you'll have to see it in action to believe it. For a quick and convincing demonstration, contact Marquette.

NEW POWER—Swench, size for size, gives greater—and more effective—torque than power wrenches . . . multiplies torque applied to handle over 1500% (yet all Swench's power is built into the wrench itself).

NEW ECONOMY—Swench saves in *many* ways . . . no auxiliary equipment to maintain and man, no costly upkeep on the wrench, no man-hours fighting frozen nuts—*and* Swench costs less than half as much as wrenches with comparable impact power.

NEW VERSATILITY—*One* Swench can handle more bolt sizes than any power wrench . . . loosening or tightening requires no special adjustments.

NEW TENSIONING ACCURACY—Precise tightening is assured with Swench, following simple instructions.



INSIDE STORY—How is all this possible? Unlike power wrenches that deliver many tap-like blows, or ordinary manual wrenches that apply steady torque, Swench builds up power in its super-strong spring for a mighty wallop that is released as torsional impact every time the handle is advanced slightly more than 30 degrees.

Write for further information.

"When you're up against the tough nuts . . .
Don't wrench it . . . SWENCH it!"

MARQUETTE DIVISION

CURTISS WRIGHT

CORPORATION • 1158 GALEWOOD DRIVE, CLEVELAND 10, OHIO

For more facts circle 524 on Reply Card

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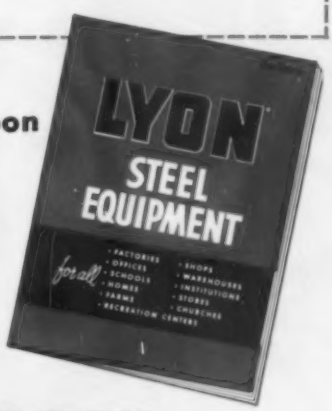

92-PAGE BUYING GUIDE

helps you get the most for your steel equipment dollars

• New 92-page catalog illustrates and describes LYON's diversified line of steel equipment . . . over 1500 items for Business, Industry and Institutions. There's a Lyon dealer as near as your telephone.

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General Offices: 891 Monroe Ave., Aurora, Illinois
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LYON®
STEEL EQUIPMENT

For more facts circle 525 on Reply Card

Indoors or out, rugged Anaconda Duralox means fast, easy installation because it needs no rigid conduit. Its reliable Anaconda Butyl (AB) rubber insulation

PROBLEM:

Installing high-voltage cable without rigid conduit

SOLUTION:

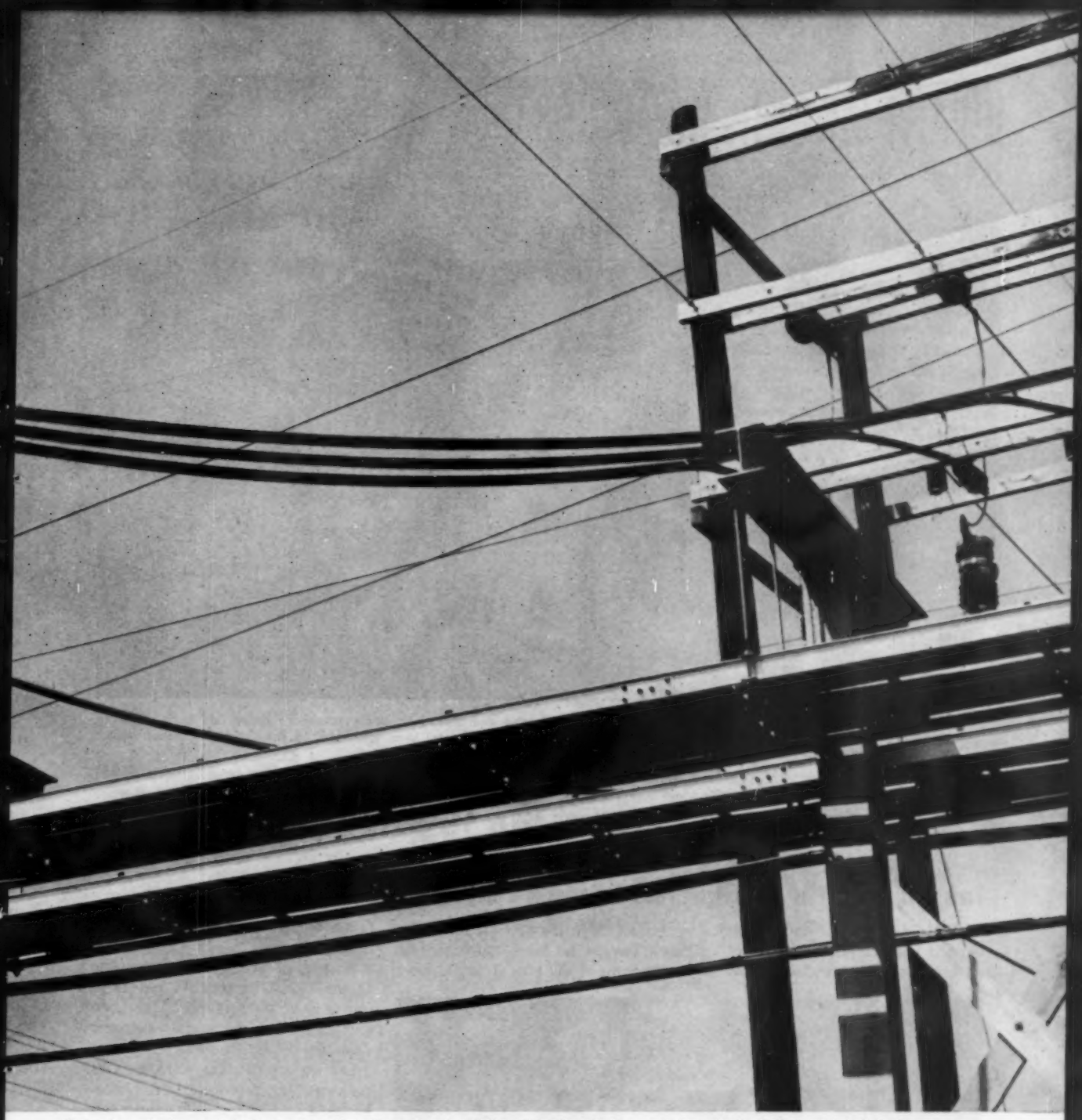
Use Duralox, Anaconda Butyl (AB)-insulated interlocked-armored cable.

You save time . . . you save money . . . you save manpower —with Anaconda butyl-insulated Duralox.* For Duralox has its own conduit of durable, yet flexible, metallic armor.

This means fast and easy installation in long runs over and around obstructions, in trays, indoors or out—and all without the expense, trouble and time of laying rigid conduit and pulling cable through it.

Duralox will fit into your long-range plans as well—because it's 100% salvageable and can be readily moved as your plant layout changes.

Duralox's lower reactance—because of the close spacing of the conductors—results in reduced voltage drop



offers extra protection against ozone and moisture. Above is an installation of Duralox with thermoplastic protective jacket over interlocked armor.

and more efficient power distribution. Available in ratings of 5 kv, 15 kv, and higher, in addition to lower voltage ratings.

Whether your problem is wiring a new plant or rewiring an old one—see the Man from Anaconda. Duralox is just one of the many types of Anaconda wire and cable that can help you increase plant flexibility . . . reduce operating costs . . . bring in new power for your needs today and tomorrow. For full information on Anaconda Duralox Cable write for Bulletin DM-5606 to: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

DURALOX HAS ANACONDA BUTYL (AB) RUBBER INSULATION FOR

- extra-high resistance against ozone
- exceptional moisture resistance
- 22% more current-carrying capacity than 70° centigrade insulation

SEE THE MAN FROM

ANACONDA®

FOR BUTYL-INSULATED
DURALOX POWER CABLE

*Reg. U. S. Pat. Off. 60297

For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

In-Plant "Packaged Handling" Reduces Parts Damage

SIMPLE, INEXPENSIVE wooden devices for in-plant handling of small gas turbine parts are cutting costs by saving time and reducing parts damage at our company's Industrial Products Division in Seattle.

Painted bright yellow for visibility, the new equipment offers the dual advantage of "open" packaging and identification, plus the protection and separation necessary to prevent damage during various in-plant handling phases prior to final assembly. Previous protective handling measures, including wrapping and the use of cardboard containers and separators, have been supplanted by the new system.

The system uses plywood peg boards, frames, boxes and dividers to protect and separate parts for small gas turbine engines manufactured in the plant. Parts thus protected range from accessory drive housings to bearing retainers. Handling equipment designed for multiple use includes interchangeable slotted dividers for skid-mounted metal bins or roller equipped smaller parts carriers, skids with large peg boards mounted on A frames, and smaller peg boards with dowel fixtures. *From a release of Boeing Airplane Co., Seattle Wash.*

Skid-mounted peg board A-frame, left, holds accessory drive end caps. Dowels hold gears. "Egg crate" and metal bins with slotted dividers hold other items.

Train Runs Through Plant, "Rebadging" 500 Employees in a Single Day

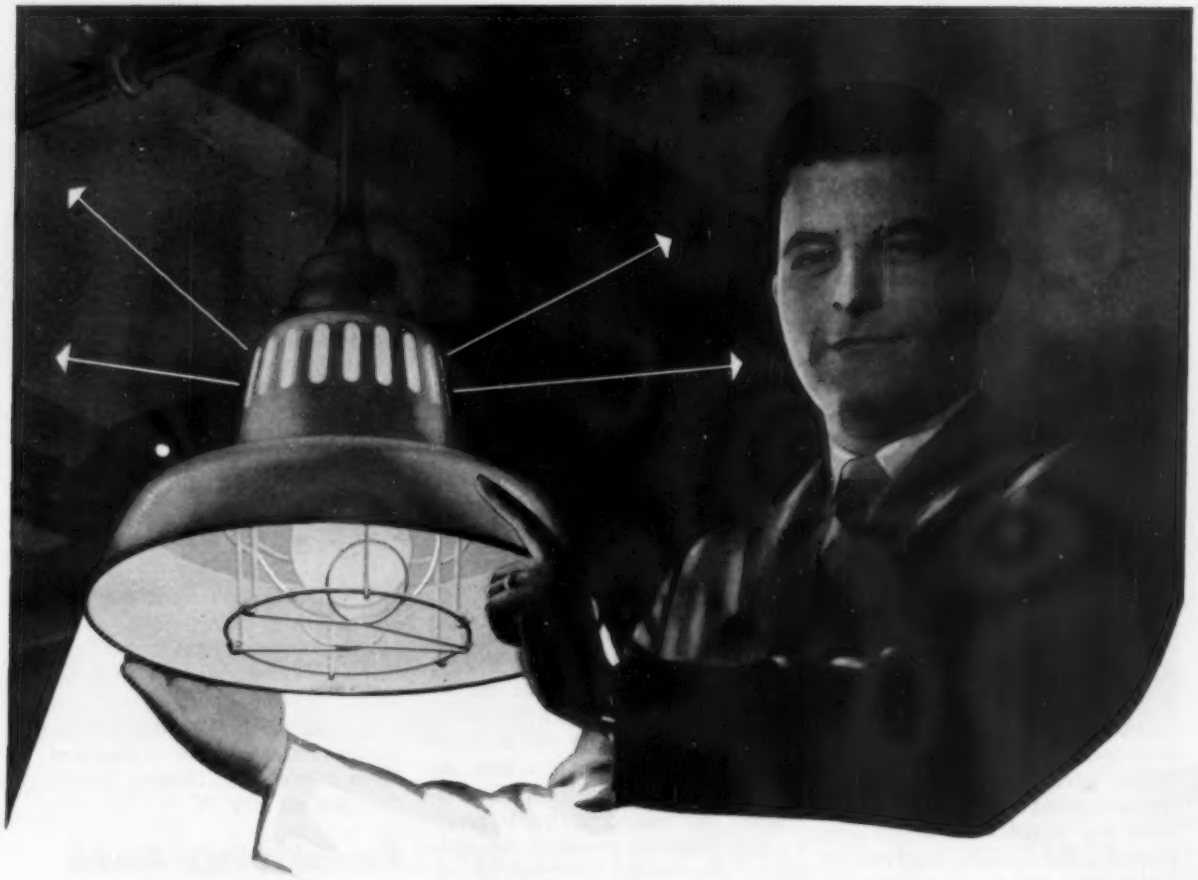
A MOBILE "BADGE TRAIN" which carried cameras and equipment to all corners of our widespread plant enabled us to photograph and issue new badges to 8000 employees in a fraction of the time it would have taken to reissue badges in the ordinary manner.

Instead of having employees come to the industrial security offices in relays to be photographed, the train carried a polaroid camera, electronic flash and office records to designated areas on an efficient schedule. As many as 500 employees were photographed and badged in a day by this method, with a minimum of time-loss from work.

Success of the rebadging program was due largely to preliminary planning which utilized the company's IBM equipment to analyze location and number of workers. By knowing where in the numerous buildings of the plant they were located, planners worked out a schedule which kept the badging crew busy without the employees having to line up for their pictures.

(Continued on page 42)

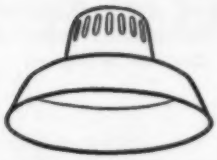
"Rebadging" of employees was carried out by crew traveling around plant.



Now you can get optional

SLOTTED Reflectors

on these Crouse/Hinds Lighting Fixtures



Explosion-proof—Type EV, Dust-ignition-proof—Type DL in slotted dome or angle reflectors.

Vapor-tight, weather resistant types V and VM in slotted dome or angle reflectors.

Reduce fatigue, accidents and worker tension; improve working environments and employee relations. In both original and replacement installations in major plants, the new slotted reflectors—exclusive with Crouse-Hinds—produce the following results:

- Elimination of dark, dungeon-like areas above reflectors
- Elimination of harsh brightness contrast, improving visibility and seeing comfort
- Reduction of fatigue of workers, and accidents due to fatigue
- Increase of production in machine work, assembly and inspection operations
- Reduce fixture operating temperature and worker discomfort from reflected heat, especially with low-hanging fixtures
- Reduced accumulation of dirt and dust, due to improved air circulation through reflectors
- Slotted reflectors are white enamel finish inside and out

FOR COMPLETE INFORMATION on all Crouse-Hinds lighting fixtures equipped with the new slotted reflectors, call your nearest Crouse-Hinds distributor, or write us.

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SYRACUSE NEW YORK

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CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.

For more facts circle 527 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

The new badges issued to employees have photos of the man or woman, with security and job data on both front and back of the badge. They are laminated between plastic.

A five-man crew operated the "badge train". Three employees were used to place lettering showing the employee's name and clock number on boards to be included in the photo. One man operated the camera and the fifth applied protective coating to the pictures. Two persons were photographed twice on each sheet of polaroid paper. As many as 58 persons were handled in a 35-minute period.

After the pictures and job data were laminated into the badge, the badges were distributed to security representatives in units about the plant for distribution to the employees. The badges featured reusable clips which can be removed when a worker terminates and turns in his badge. *From a release of Chance Vought, Dallas, Tex.*

Quick Detection of Leaks

A QUICK, economical quality control check is being used by Ansul Chemical Company, Marinette, Wis., to assure that the fire extinguishers they produce will leak no more than ¼ ounce in 10 years.

Three electronic halogen leak detectors are used to keep their products within the limits of Underwriters' Laboratories and U. S. Coast Guard standards. The detectors provide substantial savings over other leak detection methods evaluated before the present production line was installed.

Each extinguisher is twice checked for leaks; once when it is filled and again just before it is packed for shipment. In both cases the detectors respond to the presence of a halogenated hydrocarbon included in the expellant gas of the dry-chemical extinguishers.

The first test is limited to locating gross leaks at the container closure. Its purpose is to eliminate those extinguishers that are leaking fast enough to contaminate the atmosphere in the area of the sensitive final check. The test is made by passing the probe of a leak detector over the seal of each container, and discarding any "leakers".

The final test, made in the shipping department, identifies all extinguishers leaking at a rate of more than 0.025 ounces a year. To check all parts of the container for leaks, each extinguisher is enclosed in a metal sphere. After two minutes, a cap on top of the enclosing shell is removed and the air inside tested using the leak detector.

Charged extinguishers are placed in shells. Detector probe indicates a leak.

This technique accumulates leaking gas to a detectable level. By using it in conjunction with the General Electric detector, which can sense halogen content down to 0.75 parts per million, all "leakers" can be eliminated prior to shipment. *From a release of General Electric Co., Schenectady, N. Y.*

Waterproof Storage for Aluminum

A WATERPROOF envelope for corrugated aluminum roofing, allows the roofing to be stored outdoors in any weather.

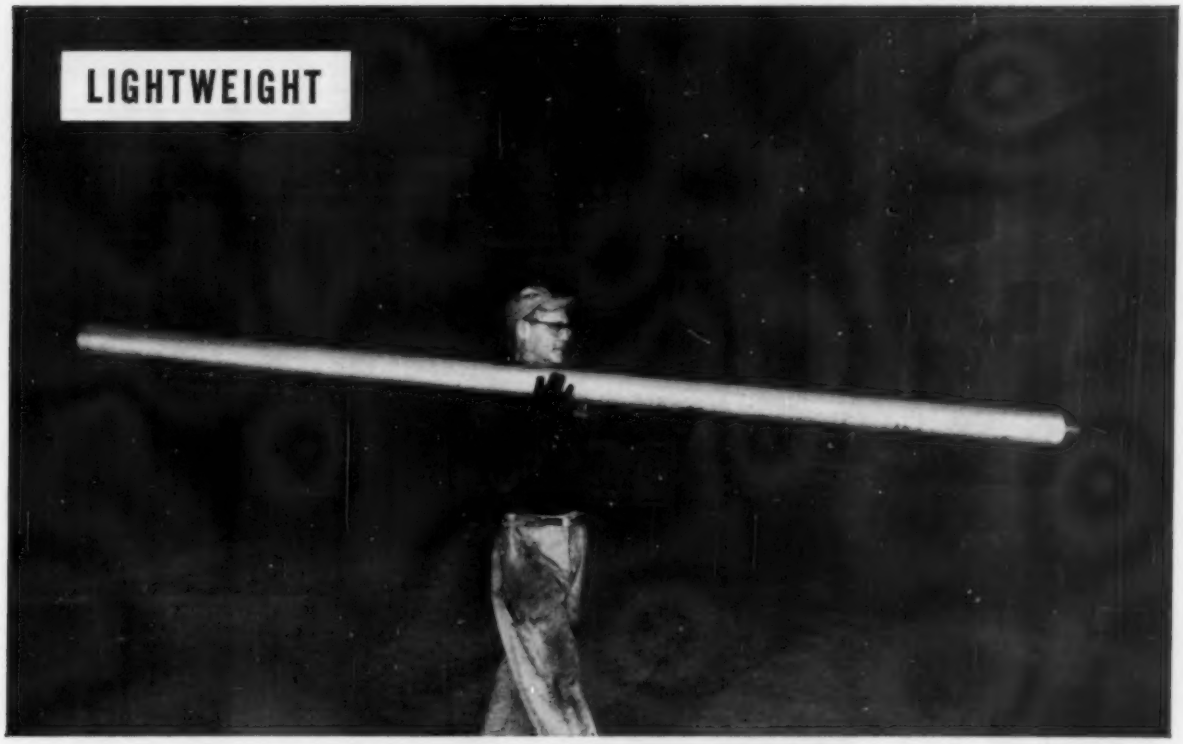
The envelope is made up of sheets of medium gage polyethylene and waterproof laminated paper. A layer

(Continued on page 44)

How To Tidy Up a Tool and Storage Room—Use Modular Cabinets

Before . . . in tool storage room at Ehrhardt Tool and Machine Co., St. Louis, Mo., tools were often difficult to locate.

After . . . area was modernized with modular steel cabinets, items are easily located. Drawers hold up to 400 lb. Supplies are all within easy reach, not more than 59 in. off floor. (From a release of Vidmar, Inc., Williamsport, Pa.)



Reynolds Aluminum Rigid Conduit
REDUCES HANDLING TIME AND LOWERS COSTS

Lightweight Reynolds Aluminum Rigid Conduit weighs far less than conventional conduit. Electricians prefer it because handling and installation are easier and faster. Special tools for bending and forming are not necessary —nor is special equipment required for cutting or threading.

Aluminum conduit resists corrosion, thus it can be used in most industrial atmospheres. And, as aluminum conduit is non-magnetic, longer conductor runs or smaller conductors are often possible.

For complete information and names of Reynolds Aluminum Rigid Conduit distributors, call your Reynolds Sales Office or write *Reynolds Metals Company, Box 2346-EQ, Richmond 18, Va.*

Watch Reynolds TV Shows: "Bourbon Street Beat" and "Adventures in Paradise"; and, resuming in October, "All Star Golf"—ABC-TV

For more facts circle 528 on Reply Card

"Call FOSTER for Rail"...Get Relayers PLUS

Installing or expanding in-plant trackage? Foster will deliver Quality Relaying Rail at lower cost . . . "plus" all necessary new track accessories, switch material—even the track tools to do the job. To help select the materials best suited to your job, call the Foster Track Specialist.

You will save on freight from Foster's nationwide warehouses, all of which stock all sections of relaying rail "plus" new rail for crane runways and specialized applications.

Another "plus": Foster's Track Inspection Kit, which illustrates all the elements needed for an efficient industrial siding. It's a real help for proper track maintenance.

Write L. B. FOSTER CO. for free Track Kit PE-8
Pittsburgh 30, New York 7, Chicago 4, Houston 2, Los Angeles 5, Atlanta 8, Cleveland 35.

Faster From Foster

Pipe • Rental Steel-Sheet Piling • Pipe Pile • Rail

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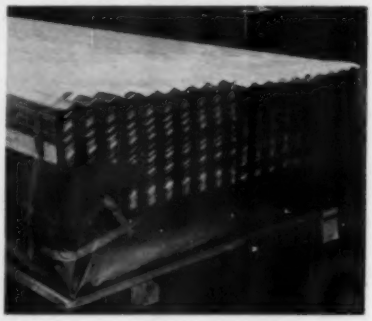
PLANT ENGINEERS' DIGEST

(Digest begins on page 40)



Waterproof envelope keeps roofing in good condition during outdoor storage.

of these materials is put down on the skid and the roofing sheet is laid on top. Then the envelope is slipped over the roofing. Next, boards are placed around the bundle and the whole package, including the skid, is power banded with 1¼-in. high tensile strength steel straps.

The finished bundle can be transported by fork lift or most other material handling devices used at a building site. *From a release of Kaiser Aluminum & Chemical Corp., Oakland, Calif.*

"How Much" Labels Save Money

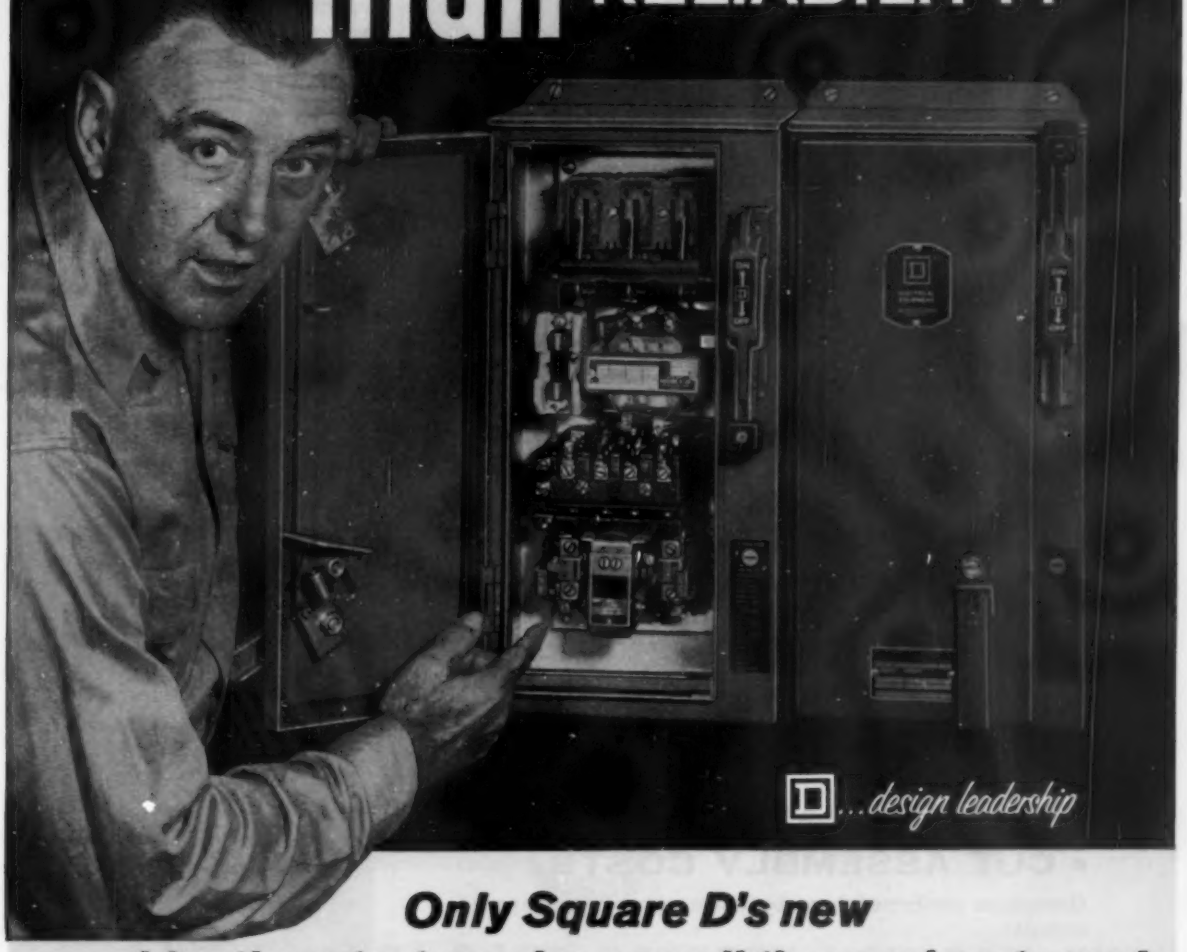
LESS THAN a day's clerical time and less than a dollar's worth of blank labels have resulted in a plan that has saved thousands of dollars for Paramount Paper Products of Omaha, Nebraska. The efficiency step, called by Paramount the "perpetual pricetag" is applicable to plants in all industries.

The plan was conceived by one man and executed within a single workday.

The system calls for clerks to mark the name and replacement cost of each production machine in the plant on pressure-sensitive blank labels. The job took about six hours of concentrated effort and the cost for materials was estimated at about 75 cents retail. In Paramount's case, the labels were free since the company manufactures them.

Labels were affixed on each machine in a place where the operator would view the cost of his particular unit frequently during the workday. An immediate result of the perpetual

a New HIGH IN SAFETY AND RELIABILITY!



Only Square D's new combination starters give you all these advantages!

EXTRA SAFETY! • Operating handle permanently attached to switch—eliminates hazard of false handle indication. • Double protection against opening door with switch "ON." • Visible Blades on switch mean safety you can see. • Door must be completely closed before switch can be operated.

REAL RELIABILITY! • Really dust-tight—NEMA 5-12 construction keeps out dust and coolant • Door closes snugly every time—latches at both top and bottom to make tight seal. • Simple closing mechanism—no complicated linkages to get out of adjustment. • Rugged construction throughout for extra-long life.

SO SIMPLE TO USE! • Front operation makes ganging easy. • Plenty of wiring space—all through-wiring with line terminals at top, load terminals at bottom. • Fuse clip-spacing and sizes easily changed to simplify horsepower or voltage change.

***Get the Complete Story** on the newest, safest, most dependable combination starter available*
Write Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

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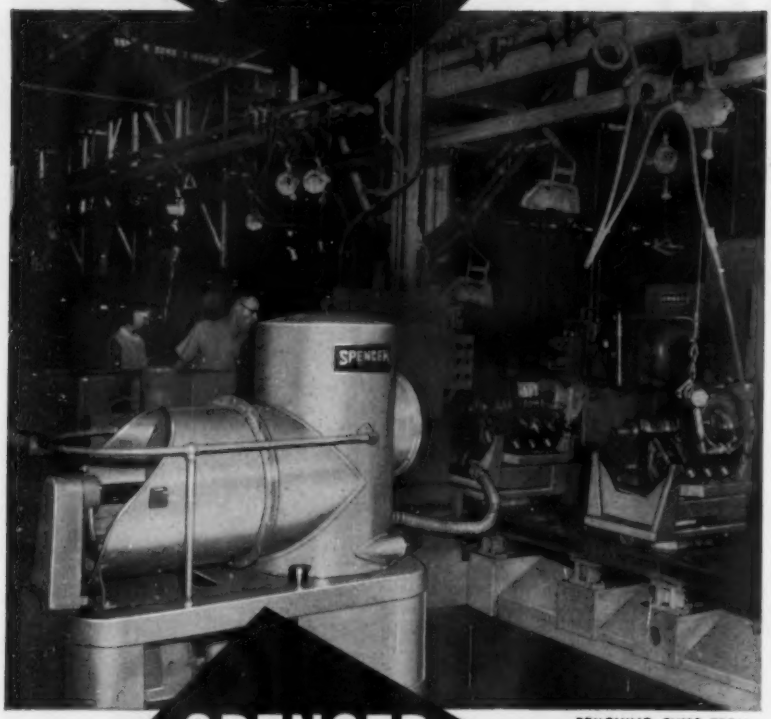

REMOVING CHIPS FROM WATER PUMP PASSAGE HOLES AFTER MACHINING. CHRYSLER ENGINE PLANT, DETROIT, MICH.

SPENCER
VACUUM CLEANERS

• GUARD QUALITY
• CUT ASSEMBLY COSTS

Operations performed here by Spencer vacuum cleaners include:

• Removing chips during assembly of head to block • Cleaning oil filter pad inlet passages • Automatically cleaning bearing cap assembly on block • Automatically removing core sand from engine block castings • Cleaning floors and conveyors.

In large plant or small... for maintenance or production needs... portable units or installed systems... whatever your requirements, it will pay to check with SPENCER.

REQUEST CATALOG #155B
ON "INDUSTRIAL VACUUM"

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts circle 531 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

pricetag was noted by the supply department, which spotted a slight increase in the amount of cleaners and maintenance aids used throughout the plant.

Since the plan was first instituted a year ago, repairs have dropped appreciably. Machines are cleaned with more care and situations that put unnatural tensions on the machines have been reduced to a minimum. In all, the company estimates that a dollar's investment has resulted in a yearly saving of 14.6 per cent in machinery and parts costs, plus an incalculable benefit from less downtime due to machine failure. *From a release of Systems Council, New York, N.Y.*

Moving Corrosive Slag

Designed to handle corrosive materials, with minimum maintenance, 3 cu yd bucket, operating from overhead crane, moves blast furnace slag at Pittsburgh Coke and Chemical Co. (From a release of Blaw-Knox Co., Pittsburgh, Pa.)

Vibrating Screen Aids Inspection

FINAL SORTING of fiber and plastic parts and rejection of unwanted material, broken parts, etc., prior to packaging, is accomplished with an electro-permanent magnetic vibratory feeder arrangement at Iten Fibre Co., Ashtabula, Ohio.

The old inspection method for the parts, which include punched bushing, gasket and electrical parts, flashlight barrels and vacuum cleaner tubing, consisted of manually

BUY THE LOWEST-COST BATTERY YOU CAN FIND

New 800 amp-hr Model TGS Exide-Ironclad. Same outside dimensions as former 720 amp-hr battery. Other new 22⅝-in. high Exide-Ironclad Batteries in capacities from 400 to 1280 amp-hr.

In the whole world, only the new Exide-Ironclad TG Super gives you so much battery power for so little. Packs 11% more power with no increase in size. That means your present trucks can do more work every shift. And this more powerful battery actually costs you less per amp-hr. Same long Exide-Ironclad life potential for low annual cost. Search all you want. You'll discover, as most others have, that the Exide-Ironclad is truly the lowest-cost battery you can find. Write for our new bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

New Exide battery for small industrial trucks and personnel carriers. Model 3-KCS-9. Features new-design tubular positive plate. Up to 30% more capacity than automobile batteries. Up to four times their average life. Fits same compartment. Write for new bulletin.

Exide®

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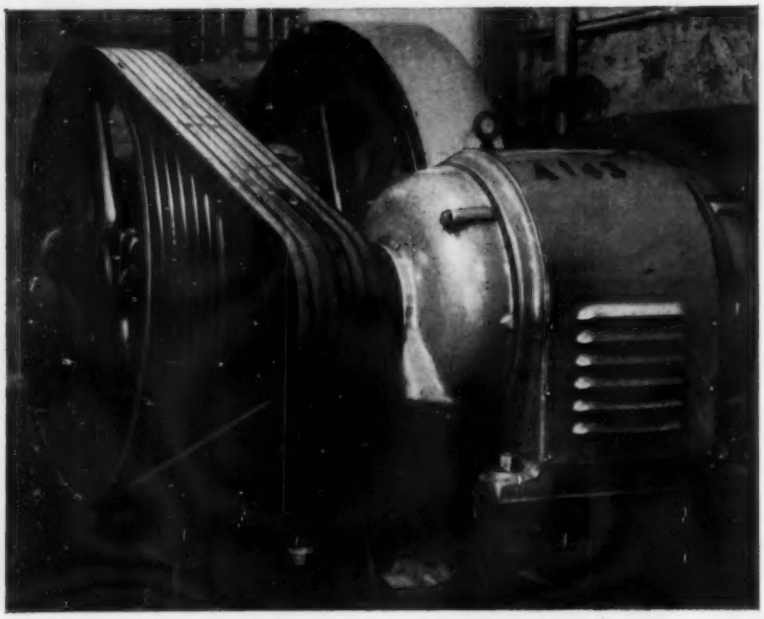
AP SUCCESS STORIES SPELL S-E-R-V-I-C-E



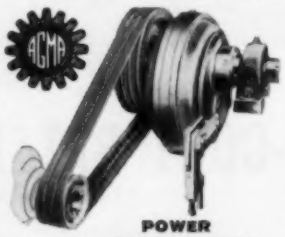
V-Belt Drive works 96-hour week for 21 years...without maintenance

The Company: American Molasses Co. of Brooklyn, N. Y.
The Machine: Air Compressor. The Drive: AP's V-Belt "Econ-o-Matic."

This AP installation includes 40-HP drive and 6-C section V-belts. Of major importance is the "Econ-o-Matic" Motor Base. It permits *automatic* adjustment of belt tension to variations of load on the motor. This means constant control over factors, such as slip, that affect belt wear.

Result for American Molasses: a prompt stop to steady cost-drains of previous equipment . . . 21 years (since 1939) of maintenance-free service . . . no end to savings in sight!

Such success stories are the rule with AP installations—because each is based on S-E-R-V-I-C-E of the *individual* power transmission need. Your own specific needs will be met by your AP Distributor . . . dependably, economically. Call him today!



POWER TRANSMISSION BY AP

One dependable source for every basic item needed for efficient power transmission through belts. Save power, lower costs, boost efficiency with:

- Shaft-King Speed Reduction Drives
- Adjusto-Slide Motor Bases
- American Steel Pulleys
- Econ-o-Matic Motor Bases
- Fixed Pitch V-Belt Drives (Q.D.V.-3, 58)
- Adjustable Diameter V-Belt Drives

AP THE AMERICAN PULLEY COMPANY
4200 WISSAHICKON AVENUE • PHILADELPHIA 29, PA.
A division of VAN NORMAN INDUSTRIES INC.

2392

For more facts circle 533 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

Vibrating screen culls broken parts; perfect ones drop into shipping boxes.

dumping the parts into variously sized screens which were then manually agitated to sift out waste material.

Now, parts drop from a hopper into a feeder which moves them at any required speed into the tray of a large feeder, which is specially designed to take variously sized screens. As the parts are moved by vibration to the end of the screen, the sludge, rejects, mis-blanks, etc., drop through the screen to a vibrating tray which moves them to a scrap bin. Perfect parts fall from the end of the screen into packages, ready for shipment. *From a release of Eriez Mfg. Co., Erie Pa.*

Air Preheater Tube Cleaning

BY USING a powerful air-driven motor and a heavy duty carbide-tipped drill bit, boiler air preheater

Air-driven motor with heavy duty carbide-tipped drill bit used to clean tubes.

For more facts circle 534 on Reply Card →

This shop cuts costs by using STANICUT *Oil 137 BCS*

Machines seven metals, one plastic with this one cutting fluid

Shank Manufacturing Company, Chicago, cuts production costs three ways by using STANICUT Oil 137 BCS. (1) The 15 Warner & Swasey Lathes are never down for change of cutting fluid when the metal being worked is changed. There's no time lost with shutting down, cleaning up and changing oil. (2) There are no losses from the use of the wrong cutting fluid. (3) Floor space is used for productive machinery instead of being tied up as storage space for barrels of different cutting fluids.

Titanium, brass, alloy steel, aluminum and seven grades of Stainless plus Teflon plastic are all worked on the machines. Latest equipment, a reputation for good work, experienced operators and on-time delivery keep business coming to Shank. STANICUT Oil 137 BCS helps Shank hold down manufacturing costs.

Does cutting costs with a cutting fluid interest you? Let one of Standard Oil's experienced lubrication specialists show you how STANICUT Oil 137 BCS can do it. Call the Standard Oil office nearest you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

Frank Kruppe, Shank president (left) shows Hank Krueger of Standard Oil one of the pieces Shank Mfg. produces. Hank Krueger provides Shank plant with technical service on cutting fluids. Hank has the experience for this work. He's been doing it for six years. He has an engineering degree from Illinois Institute of Technology and has completed Standard's Sales Engineering School.

You get better light . . . use less power . . . get 700% longer lamp life with

WIDE-LITE JUNIORS!

The exclusive rectangular reflector of Wide-Lite Juniors gives the broad light pattern that's unique in the lighting industry! Frequently, one Wide-Lite takes the place of three regular floodlights. Wide-Lite Juniors with color-corrected mercury vapor lamps use 61% less power. And with 700% longer lamp life, you can *depend* on them to keep vital areas well lighted!

More than DOUBLES light output!

At 250 watts, Wide-Lite Juniors with mercury vapor lamps have 10,500 lumen output as compared with 3,700 for incandescent lights . . . at 100 watts, 3,300 lumen output as compared with 1,630 for incandescent lighting. And Wide-Lite's segmented, rectangular reflector gives a broad light pattern without "hot spots" or shadows!

Find out how much better floodlighting Wide-Lites give you —send coupon today!

WIDE-LITE CORPORATION

Houston, Texas

In Canada: Wide-Lite Division of Wakefield Lighting, Limited, London, Canada

OUTDOOR AREA LIGHTS
SPORTS LIGHTS
PROTECTIVE LIGHTS
VAPOR TITE MODELS
INDOOR LUMINAIRES
MOBILE WORKING LIGHTS

WIDE-LITE

SEND FOR FREE INFORMATION . . . . .
WIDE-LITE CORP., P.O. Box 181 Houston 1, Texas
Please send Wide-Lite data
(Print name, firm and address below)

For more facts circle 535 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

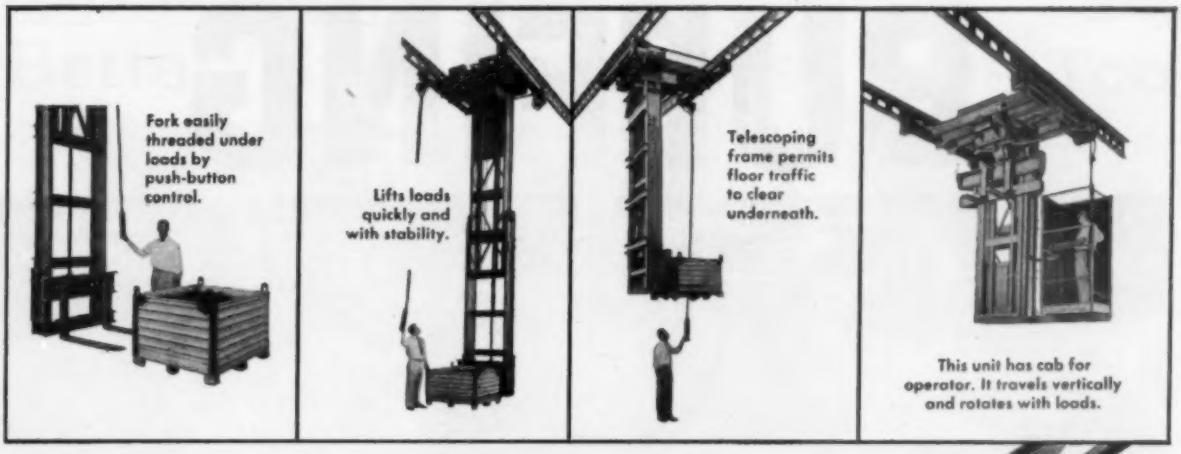
tubes can be cleaned in a confined area. Where roof clearance is six feet or more, or where the roof can be removed, powerful drill-type cleaners may be more economical for extensive jobs involving badly plugged tubes. But where headroom is limited, ordinary boiler tube cleaners are often recommended. Although less powerful than drill-type cleaners, they can be readily inserted into a tube even where the heater roof comes to within two feet of the tube sheet.

When using this type of equipment it is well to remember that accessories ordinarily used with mechanical boiler tube cleaners are not always suitable for the solid plugging frequently found in air preheater tubes. Carbide-tipped drill bits attached directly to the motor rotor shaft by an adaptor have been found to be effective.

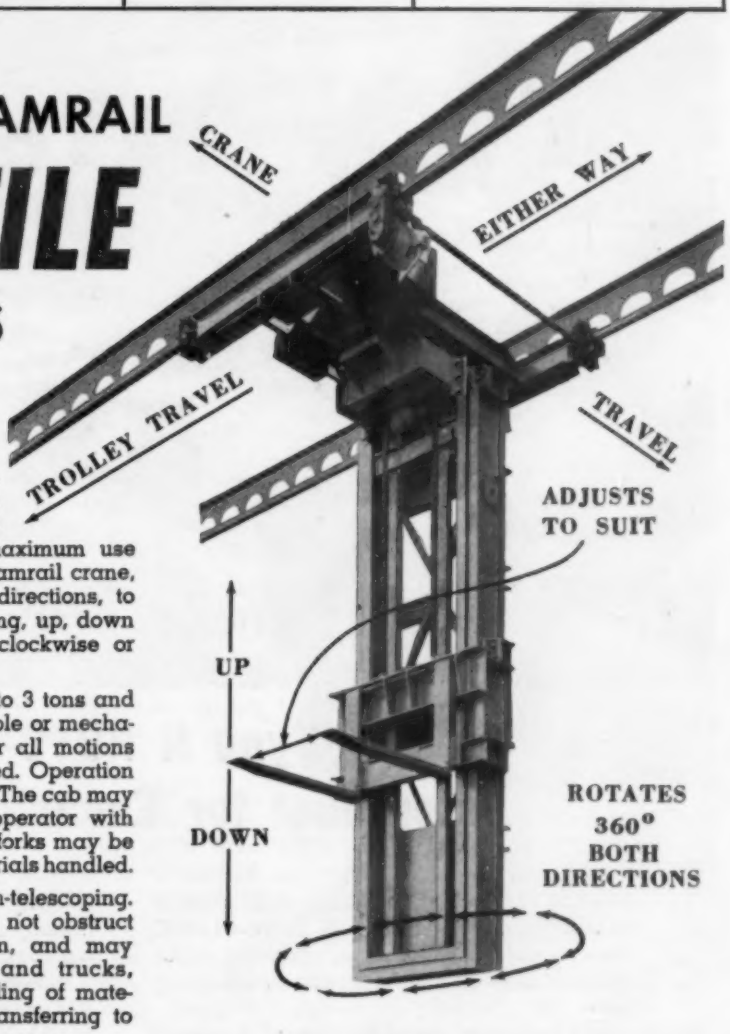
Use of powerful motors where such drill bit arrangements are used, is recommended. Six-bladed vane-type air motors are particularly recommended. The motor diameter should be ¼ in. to ½ in. less than the inside diameter of the tube to be cleaned. This permits upward passage of chips being dislodged from heavily plugged tubes. *From a release of Thomas C. Wilson, Inc., Long Island City, N. Y.*

Quick Handling

Two strips of pressure sensitive tape bundle different size packages, expedite handling. (From a release of Minnesota Mining & Manufacturing Co., St. Paul.)


Fork easily threaded under loads by push-button control.
Lifts loads quickly and with stability.
Telescoping frame permits floor traffic to clear underneath.
This unit has cab for operator. It travels vertically and rotates with loads.

CLEVELAND TRAMRAIL
VERSATILE
STACKERS



THE maneuverability of Cleveland Tramrail stackers enables obtaining highly efficient handling coverage of a warehouse with maximum use of space. When on a Cleveland Tramrail crane, a stacker can be traveled in all directions, to front, rear or either side of a building, up, down and turned through a full circle clockwise or counter-clockwise.

Stackers are available for loads to 3 tons and lifts to 20 feet. They may be as simple or mechanized as the work requires. Any or all motions may be manually or power operated. Operation may be controlled from floor or cab. The cab may be traveled vertically to provide operator with maximum visibility of work. Lifting forks may be designed and spaced to suit the materials handled.

Design may be telescoping or non-telescoping. Telescoping type (illustrated) does not obstruct aisleways when in raised position, and may be traveled over railroad cars and trucks, thereby permitting the direct handling of materials to storage without need of transferring to other conveyances.

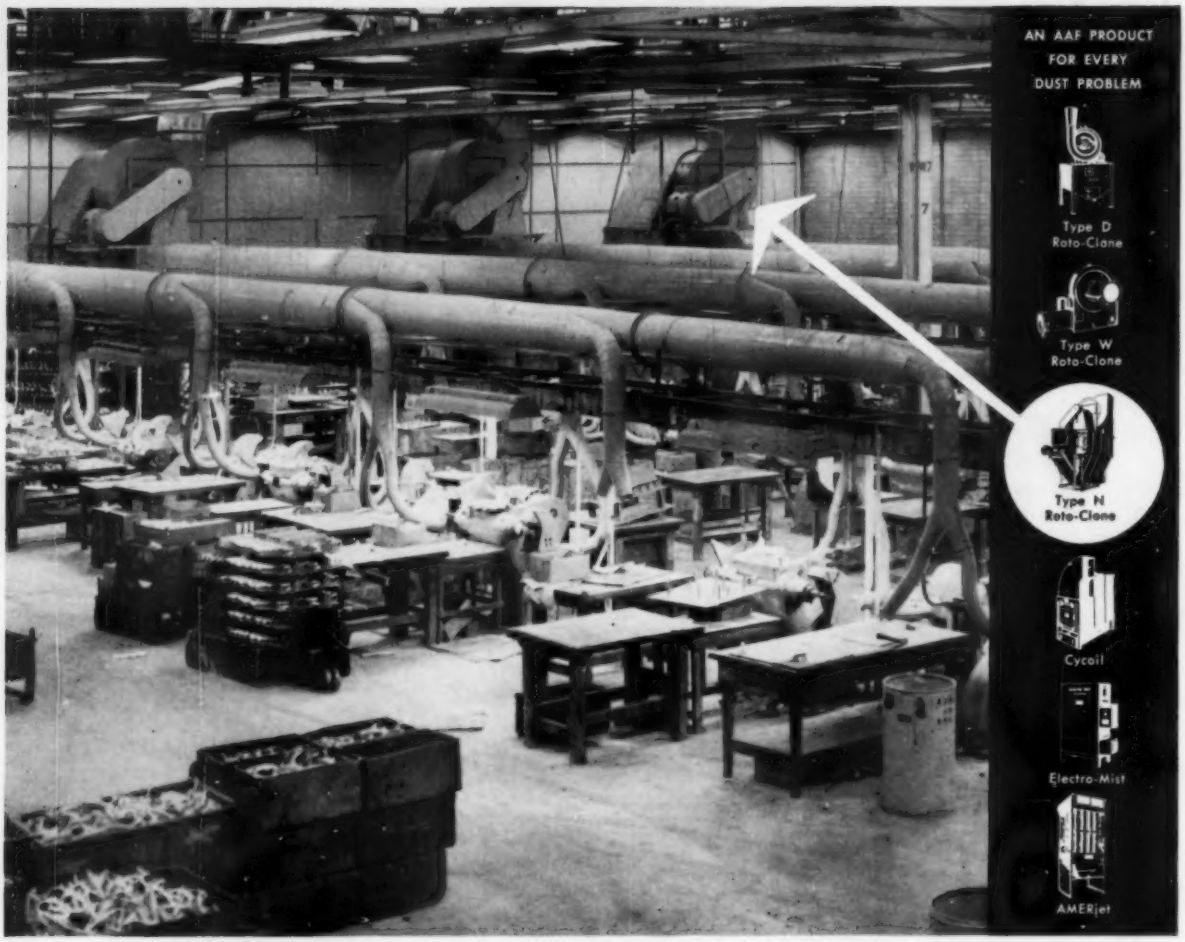
Cleveland Tramrail stackers and supporting cranes have much to offer. They can be designed to exactly suit your needs. Why not have a nearby Cleveland Tramrail engineer fill you in on the details.

CLEVELAND TRAMRAIL
Overhead Materials Handling Equipment

Cleveland Tramrail Division • The Cleveland Crane & Engineering Co. • 7554 E. 290 St. • Wickliffe, Ohio

For more facts circle 536 on Reply Card

BUFFING



AAF Type N ROTO-CLONES stop dust for Electric Auto-Lite

● This sparkling clean buffing area in Electric Auto-Lite's Lockland, Ohio, plant is visible proof of the effectiveness of AAF's Type N ROTO-CLONE. These rugged wet collectors are exhausting 80,000 cfm from manual buffing of die-cast auto accessory parts.

AAF's complete line of dust control equipment was application-developed, now challenges *any* metalworking dust problem. Where are dust, fumes or mists causing you trouble – grinding, buffing, polishing, dry machining, wet machining, heat treating, abrasive cleaning? All can be effectively and economically controlled by AAF.

If buffing dust is your problem, call your local AAF representative, or write direct for Type N ROTO-CLONE Bulletin 277. Address Mr. Robert Moore, American Air Filter Company, Inc., 228 Central Avenue, Louisville, Kentucky.

AAF American Air Filter

BETTER AIR IS OUR BUSINESS

For more facts circle 537 on Reply Card

SILICONE NEWS from Dow Corning

Better Than New...Cost Less Too

Silicone Rewinds Provide Extra HP to Handle Increased Loads . . . Overloads

From coast-to-coast, from Canada to the Gulf, nearly 200 Service Shops are now qualified and equipped to rebuild motors from your plant so that they will deliver from 25% to 50% greater horsepower than they did as originally supplied.

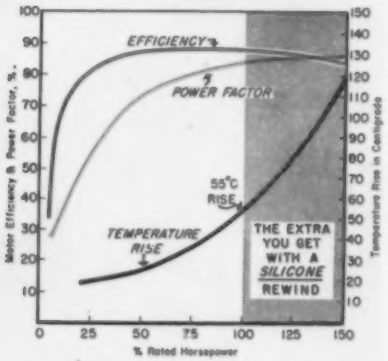
Service Shops identify these motors by affixing brass plates that read "Insulated with Dow Corning Silicones" . . . and bear the shop name.

Where motors in your plant have failed because of increased production schedules . . . a change in processing or machining techniques . . . rapid reversing . . . jogging . . . inching . . . temporary or continuous overloading . . . a silicone rewind is the cost saving solution to minimum downtime and future reliability.

Or if you're planning new processes, new schedules that will increase horsepower requirement of existing motors, consider these facts: Your present motors can be rewound with silicones for a fraction of the price of new motors — and you save the cost of new motor pedestals and mounts, fittings, wiring and controls. Furthermore, you save considerable installation time and expense.

Silicone rewinds give reliable operation in almost any surrounding — regardless of high ambients, moisture, many corrosive atmospheres. For more information, and the name of Authorized Service Shops near you, contact Dow Corning, Dept. 3208.

SERVICE SHOPS identified by this gold emblem are experienced in rebuilding motors . . . in the use of silicone insulating materials to assure top quality performance.



MOTORS REWOUND with Dow Corning Silicones give up to 50% more horsepower. Efficiencies and Power Factors are comparable to those at full load ratings of motors as originally supplied. Only the insulation changes. The extra thermal stability of silicones increases motor capability.

SILICONE REWINDS consistently produce outstanding results such as these: To increase pumping capacity 30%, thirty-one 50 and 60 horsepower pump motors were rewound with silicones — boosting their output from 50 to 75 horsepower, from 60 to 90 horsepower. Total cost was only $19,000 compared to $68,200 for new motors and mounts! After 4 years, the motors have proved 8 times more reliable!

SPECIFY Dow Corning Silicones and **SAVE!**

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

For more facts circle 538 on Reply Card

F. N. Burt Company, paper container manufacturer, says:

"WE SAVED MONEY, MATERIALS AND TIME WITH WESTINGHOUSE DT-3 TRANSFORMERS"

C. T. Hansen, Westinghouse sales engineer; C. Dean, vice president, Buffalo Electric Co., Buffalo; W. Jones, plant maintenance engineer, F. N. Burt Co., Inc., Cheektowaga, N. Y.; J. Bober, E. S. Burrows Co., Buffalo.

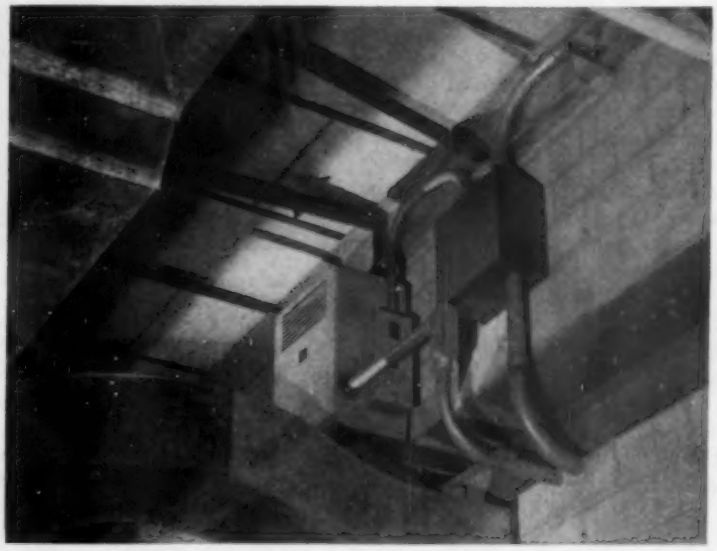
Eight Westinghouse DT-3 Transformers serve 10 acres of office and manufacturing area quietly... quietly... quietly
Maximum terminal compartment temperature 5°C rise—maximum case temperature 35°C rise

Inorganic siliclad insulation and grain-oriented Hipersil® steel cores have reduced Westinghouse transformer size 25 to 50%, weight 17 to 32% over former class B 80°C rise units. These Westinghouse exclusives are making possible significant savings in time and money on job after job. Not only that, but every Westinghouse unit is sound-level tested in an ambient of 24 decibels.

Westinghouse dry-type transformers operate at 45 decibels or below . . . 10 to 15 db's below NEMA standards. The core-coil assembly floats on a mechanical vibration damping system, independent of case, base or conduit. This unique feature accounts for the lowest sound levels ever found in dry-type transformers.

Mr. Walter Jones, plant maintenance engineer for F. N. Burt Company, says: "The Westinghouse DT-3 transformers are the quietest units I've ever worked with. We employ about 900 persons—700 of them women. They're

"In some cases," comments Mr. Dean of Buffalo Electric Co., "transformers were installed in areas congested with large air conditioning ductwork and steam piping, at times as close as 24 in. from plant ceiling. The DT-3 transformers are compact enough to fit into these tight quarters, light enough to lift into place without special hoist equipment. Easy to wire, too—terminals are located on the bottom in cool air—giving longer life and less maintenance to cables."



"These transformers serve our entire plant—office, kitchen, manufacturing area, powerhouse. With 10 acres of floor space under roof, we have plenty of maintenance to handle—we really appreciate the maintenance-free design of Westinghouse DT-3 transformers," states Mr. Jones. "All we have to do with these new units is wipe them down with a damp cloth once every six months."

particularly sensitive to noise—a constant humming irritates them. Production drops as nervous tensions increase; hence, we chose Westinghouse quiet transformers."

In addition, overhead mounting without special floor supports saved valuable floor space in the mounting of this series of eight transformers in ratings from 15 kva to 150 kva. Installation time of the Westinghouse units was just one-half the time required to install wet-type units. The largest—at 150 kva—was in place in just a few hours.

Call your Westinghouse representative or distributor for further facts. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

WESTINGHOUSE DT-3 TRANSFORMERS.....JUST A WHISPER AWAY FROM SILENCE

J-70919-R

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 539 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

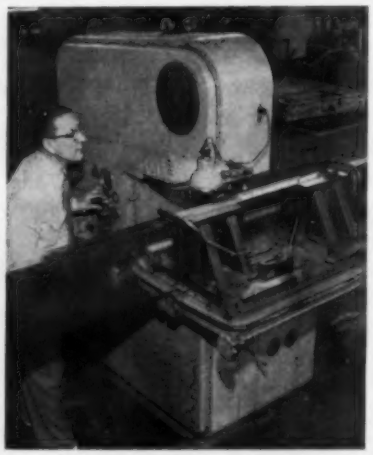
Edited by Vern Kempf

Two Bus Bars from One

UNUSUAL TOOLING of a DoALL Contour-matic band machine enabled the Foote-Burt Company, Cleveland, Ohio, to produce tapered bus bars 18 ft, eight inches long by 12 in. high without the waste of material that would be expected by other methods. The finished bus bars are three inches thick and tapered for the full length at 49.5 minutes of one degree.

Purpose of the splitting operation was to conserve material when the material was no longer needed for electrical reasons. The bus bars are used to carry and distribute electrical current to plating operations. Current carried is 20,000 amperes and the cell voltage is approximately one quarter of a volt.

The illustration shows the splitting operation in progress and details of the simple but effective tooling. A reference bar has been mounted on the power table at the pre-determined angle and the two angle plates are located against the reference bar by means of spacer blocks clamped to the T-slots. The long bus bar is simply clamped against the angle plates and supported at its outer ends.



Bus bars are split into two pieces to conserve material with this simple tooling mounted on a power band saw.

Each stroke of the power table is 16 in., therefore the bus bar had to be indexed after each stroke. To compensate for the displacement of the bar between the beginning and end of each successive index, narrower blocks were substituted after each stroke. The cutting time averaged four and one half to six hours per piece.

Conveyor Solves Storage Problem

IN-PROCESS storage and material handling probems at I-T-E Circuit Breaker Company, Philadelphia, Pa., were solved by the installation of an overhead conveyor system. The system permits storage of circuit breakers between work stations during assembly.

An 800-ft power and free overhead conveyor system, engineered and installed by Chainveyor Corporation has simplified parts-handling in the assembly area. Adjacent to the power part of the system is a second track accommodating free trolley assemblies. The motivating power line moves carriers from one area to another.

Eight separate gravity storage lines, controlled electrically by push-buttons, carry subassemblies through the work stations to permanent storage. These free lines were designed with escapement stops on 10-ft centers. The stops are opened each time a drive dog on the adjacent powered line passes. Free travel is thereby safely controlled to 10-ft stop-and-go movements.

Electrically controlled switches, operated from a central panel, feed in-process parts into gravity conveyor.

At the load station, a worker

(Continued on page 58)

Plastic Tanks Permit Visual Check and Promote Safety

RUNNING up and down wet, slippery ladders to inspect the appearance of effluent in the process of backflushing ion exchange resins has been eliminated at the Culligan Soft Water Service plant in San Bernardino, California, with the installation of clear acrylic plastic tanks. The tanks were fabricated from ½-in. Plexiglas, a product of the Rohm & Haas Company, Philadelphia.

Clear plastic tanks enable operator to keep check on backflushing operation without climbing wet, slippery ladders.

Backwashing of ion exchange resins is a preliminary step to regeneration and consists of flushing the resins with water to remove impurities picked up in water softening service. The clear plastic tanks enable the operator to check for excessive flow, which causes a loss of resin, or insufficient flow without leaving the floor. Accident hazard is reduced since it is no longer necessary to climb up metal ladders to the top of the tanks to supervise the operation.

Hall Industrial Water Report

VOLUME 8 AUGUST 1960 NUMBER 4

You Don't Need a Crystal Ball

There are times when you wish that a look into a crystal ball would tell you what is happening in boiler tubes, turbines, water lines, heat exchangers and condensate systems. Are deposits forming? Is corrosion occurring?

Actually, you don't need the crystal ball. Simple water tests will usually tell you what is going on—whether water conditions are satisfactory for control of deposit formation and corrosion or whether changes should be made in chemical treatment to avoid trouble.

Interpretation of water analyses is everyday business to Hall Laboratories engineers. One of their functions is to teach operating personnel the test procedures and what the resulting numbers mean. And the Hall engineers can help you in many other ways to keep your plant operating with a minimum of water problems—in boilers as well as in cooling, process or waste disposal systems.

Water Not Responsible

Just when operation of a new boiler in a Canadian plant was well under way there was trouble. After six months' operation a side wall tube failed due to cracking. Then three months later another cracked.

Water conditions were blamed. The Hall engineer was called in. He was able to show that satisfactory water conditions had been maintained because the operators he had trained had conscientiously carried out the chemical feeding and testing program. Furthermore, metallographic examination of specimens from the cracked tubes showed that the problem was corrosion fatigue. This pointed to alternate overheating and quenching which could only result from discontinuous cooling by the water.

More water to the side wall tubes was provided by the installation of additional water supply tubes. Cracking stopped and the boilers have now operated more than three years without an unscheduled outage.

From Heat Pumps to Dishwashers

Diverse types of equipment including heat pumps, hot water boilers, steam boilers and cooling towers were utilized for heating and cooling in a county school system. Hall Laboratories was retained to tackle the numerous scale and corrosion problems. In addition to equipment, more than fifteen miles of piping were involved, some of it buried in concrete.

Hall field engineer H. V. Gedney made a thorough survey of water usage and equipment at each school. A water conditioning program was then initiated at each and responsible personnel attended a water treatment school conducted by Gedney.

Good results followed. After a year's operation corrosion was found to be greatly reduced. Scale problems had disappeared. But water always causes trouble—Gedney was asked next to solve the problem of corrosion and deposition in the dishwashing machines.

Hunting Iron

Heavy accumulation of iron oxide in boilers at a municipal power plant made necessary frequent cleaning of the boilers. Since tests showed that the iron was entering the boilers in the feedwater, Hall field engineer E. R. Lang recommended increasing pH value of condensate and feedwater by use of a neutralizing amine (Hagamin®). This would minimize corrosion in preboiler equipment and piping and thus reduce iron content of the water.

Reduction of iron concentration was not as great as expected. Further testing led to the discovery that the main source of iron was the zeolite-softened makeup water which came from the treated water storage tank. Iron concentration of this stored water was more than one hundred times greater than iron concentration of the softened water.

Makeup water is now supplied directly from the softeners. The stored water is used only in emergencies. Iron oxide accumulation in the boilers is no longer a problem.

Dancing Water

When suddenly faced with wildly fluctuating water levels and heavy carryover from the boilers, the operating men at a steel fabricating plant called in Hall field engineer M. E. Osmond. Quick action was necessary so Osmond temporarily quieted the boiler water with a Hagan antifoam. This gave time to hunt the cause of the unusual trouble.

Condensed steam samples collected for conductivity tests were found to contain oil. The first condensate collection tank checked was found to be loaded with oil. Further tracing led to a tank in which quenching oil was heated with a steam coil. The coil was leaking, admitting oil to the condensate.

Once the source of trouble was located, correction was easy. The condensate from the heating coil was diverted to the sewer until repairs could be made.

Water is your industry's most important raw material. Use it wisely.

How Consultants Solve Industrial Water Problems

There are no "stock answers" to industrial water problems. A new 24-page booklet, "Hall Laboratories —Industrial Water Consultants," describes the many ways industry can use water most economically. For a copy of this booklet, write on your letterhead to:

HALL LABORATORIES
HAGAN CENTER, PITTSBURGH 30, PA.
Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.

For more facts circle 540 on Reply Card

OPERATION — PRODUCTION

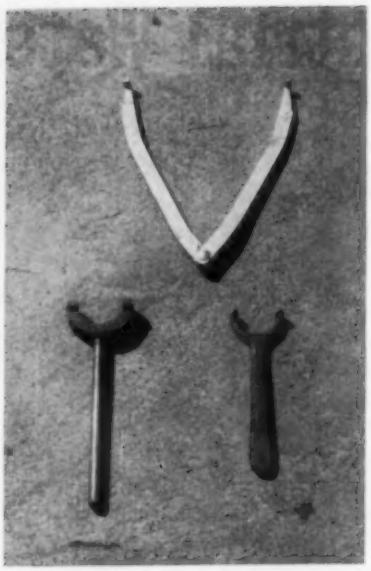
(O and P begins on page 56)

places two partially assembled circuit breakers on a carrier. The operator at the pushbutton control panel then directs the loaded carrier into any one of the eight open gravity lines which flow through the assembly cycle. While in storage, parts are readily available and re-entry into the powered system may be made at any time.

Shop-Made Wrench Saves Time

By S. CLARK, Maintenance Foreman
U. S. Phosphate Co., Tampa, Florida

IN THE COURSE of a year we receive all kinds of cans, drums and steel barrels with plugs that have to be removed with a spanner wrench. Since these bungs are of varying sizes, a wrench of the proper size is required for each plug.



Two sizes of spanner wrenches are shown below our universal wrench.

We avoided the expense of buying all these various sizes of spanner wrenches by making up a bow-legged wrench in the form of a compass, and turned up the ends of the legs to form the gripping lugs. With a swivel rivet holding the two legs together, we have an all-in-one wrench that fits all plugs. The tool is case-hardened to provide a long service life.

Tool Adaptation Cuts Costs

SHOP-DESIGNED adaptation of standard Delta industrial tools at Drain Enterprises, Addison, Ill., has completely mechanized the production of drilled and tapped sink frame lugs. With the function of three tools incorporated into one automatic machine, two men tending five machines produce as much as 15 men produced previously with individually operated tools. This reduced production costs 87 per cent.

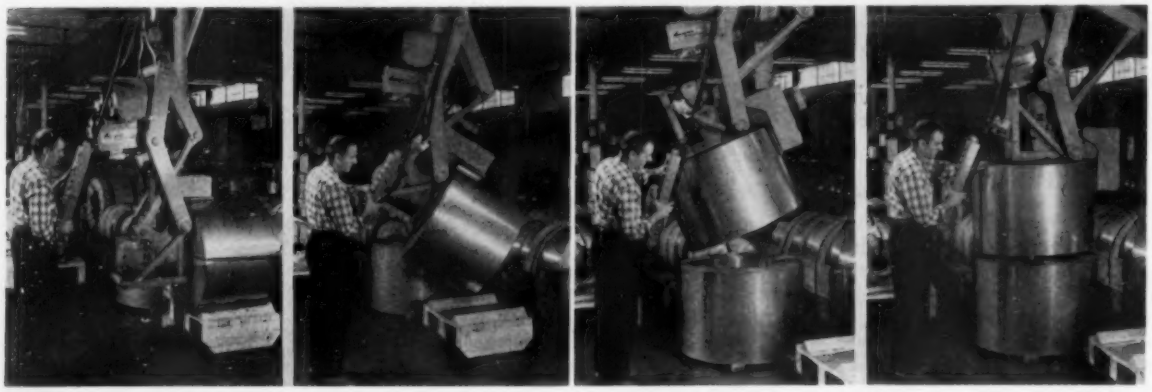
Each machine drills, taps and cuts off 40 lugs per minute from 24-ft extrusions. The three-step operation

Coil Tilter Reduces Damage, Doubles Storage Capacity and Cuts Handling Time 90 Per Cent

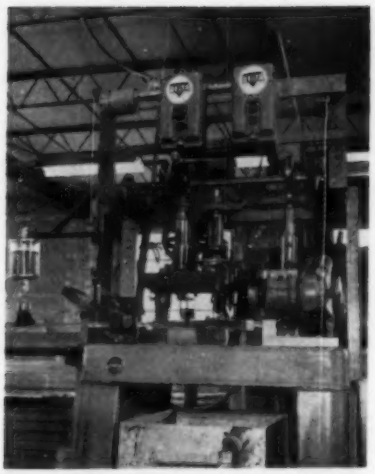
USING a coil tilting device which lifts, transports and tilts coils from horizontal to vertical in about 45 seconds, Somers Brass Company, Waterbury, Conn., is waging a triple assault on material handling and warehousing costs. According to Charles L. Emerick, plant engineer at Somers Brass, damage to the thin edges of coils in handling has been virtually eliminated, handling time has been reduced by 90 per cent and company's warehouse space doubled.

Produced by American Forge and Manufacturing Company, McKees Rocks, Pa., the coil tilter eliminates the use of conventional lifting tongs, floor mounted tilting devices and "C" hooks for handling coils weighing up to 5000 lb. Power is supplied by two motors, one of which applies an initial grip on the coil and one operating the tilting mechanism.

Electrical power for the motors is supplied from the crane or hoist by a reel and cable to a plug located on the hook block. Controls may be in the crane cab or in a pendant station with the hoist controls. Loss of power will not affect the grip on the coil since the power is normally off when the coil is lifted. The tilting operation is always under complete control of the operator and in case of power failure the unit simply stops in any position.



Sequence for lifting a coil in horizontal position and stacking it vertically on another coil. In first illustration, coil tilter is inserted into core of coil and grip mechanism is energized to grip coil tightly. Coil is lifted clear of pallet and then tilting motor is energized. When coil reaches a vertical position, crane is moved over to point of release and coil is lowered to top of another coil. Releasing grip completes the operation. Stacking coils doubles storage space.



Shop-designed machine automatically drills, taps and cuts off aluminum extrusions at rate of 40 per minute.

was made by installing two 14-in. drill press spindles on the cutoff machine table and adding a motor driven cam feed system.

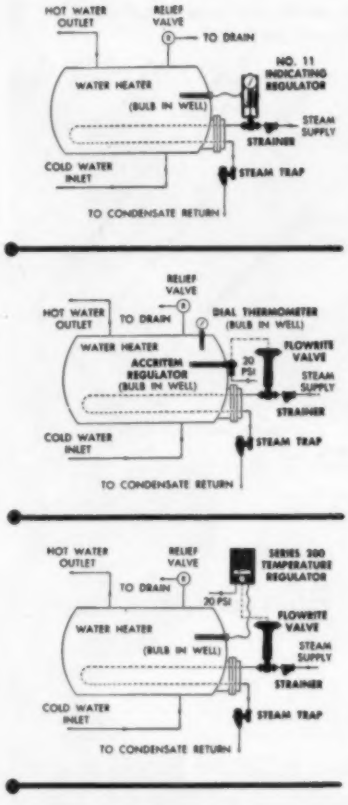
Drill press spindles are installed on top of a regular die set block with springs to return the spindles after each operation. The tapping spindle is on a floating spring mount to facilitate entry of the tap in the drilled hole. There is also a spring to return the cutoff machine arm. A cam shaft, driven by a motor reduced to 30 rpm, is mounted over the tools in an angle iron frame. The first cam actuates the feed device which advances the extrusion to a stop at the beginning of each cycle. The second cam operates the drill press spindles and the third cam actuates the cutoff machine. Finished parts drop through the table to a box below.

Coating Saves Ductwork

WHEN CORROSION hit the galvanized ductwork in a Cleveland plating plant and some holes had become apparent within the material, it seemed necessary to tear down and replace the old duct system. This solution would have entailed the labor costs involved in tearing down the old system, replacement costs and plant shutdown time.

Covering the old duct with glass-reinforced polyester eliminated all these undesirable factors. In effect, the old duct served as a mandrel on which a brand new pipe was formed. A total of 2500 ft of duct-

Practical Ways To Control Hot Water Storage Heaters



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These diagrams, plus clear and concise information on storage heater control, are available to you without obligation as part of the Powers *Engineer's Manual, Steam-Water Service.*

This manual has been specially prepared for plant use. It is available free to personnel whose job function covers operation and/or installation of steam-water service. Various control systems described and illustrated include: domestic hot water . . . instantaneous heat exchangers . . . heat exchangers for cooling . . . fuel oil heaters . . . pressure reducing . . . jacket water cooling . . . two-temperature hot water systems.

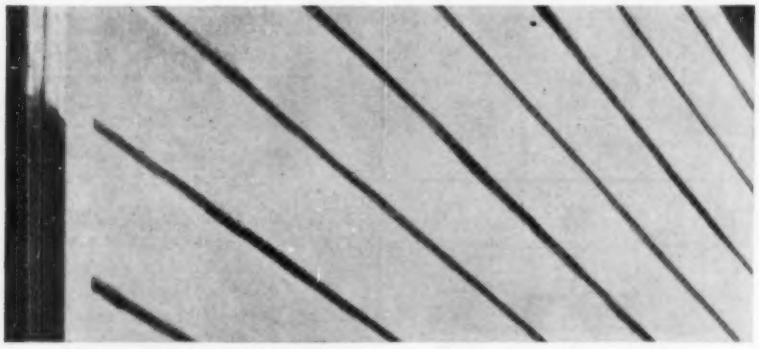
Send for your Engineer's Manual now! If you have a special requirement or problem ask for recommendations.

POWERS CONTROL

THE POWERS REGULATOR COMPANY
Dept 860, Skokie 23, Illinois
In Canada: The Powers Regulator Co. of Canada Ltd. Downsview, Ontario

For more facts circle 541 on Reply Card

BEFORE This progressive damage would not have occurred if Thoro products had been used years ago.



AFTER Thorobond, Thorite and Thoroseal were used. The masonry is as good as new.

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Is there a "best way" to protect and restore masonry?

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Yes. Use the *Thoro System*. Standard Dry Wall Products, Inc. has been an authority on masonry maintenance and protection for many years. Its products save you money because they are safe, sure and effective. Send the coupon for our new specification guide.

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Standard Dry Wall Products, Inc.

Box X-10 New Eagle, Pa.

Plants at New Eagle, Pennsylvania and Centerville, Indiana

For more facts circle 542 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

work was covered with glass-reinforced polyester by the plant maintenance department. Sizes of the ductwork vary from six to 18 in. in diameter.

First the old corroded ductwork was painted with polyester resin. Then a layer of glass mat, saturated in the resin, was placed around the

Glass mat, impregnated with polyester resin and wrapped around corroded galvanized ductwork eliminated need to tear down and replace the old duct.

ducting. Another saturated mat was applied and a finished coating of resin was then brushed over the glass.

Polyester resin used was Atlac 382, a product of Atlas Powder Company, Wilmington, Delaware. The old ductwork is now completely ignored and as particles break loose, they are removed through the ventilating system.

Lining Valves Stops Corrosion

PLANT ENGINEERS at Du Pont's Electrochemicals Department, Niagara Falls, N. Y., solved a tough corrosion problem when they started to line valves with Teflon. These valves are used in a service at 150 C and 125 psi transporting 37 per cent hydrochloric acid and organics. Normal service life was measured in months prior to the use of Teflon lining.

Application of the Teflon has restored the usefulness of the valve

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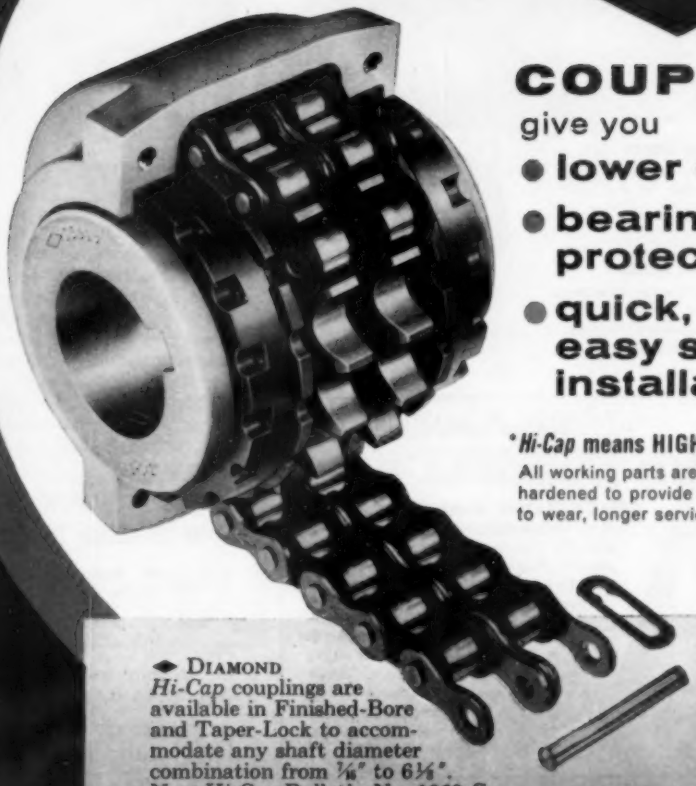
DIAMOND *hi-Cap** TM



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Efficient electric hoists...to move materials overhead and release floor space for more valuable operations.

CM HOISTS

CM LODESTAR ELECTRIC CHAIN HOIST
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½ to 5 ton capacities—Compact, enclosed design. Low headroom. Continuous duty motor with thermal overload protection for heavy duty service. Precision bearings and helical gears for long life. Only 110 volts at push button control.

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For more facts circle 544 on Reply Card

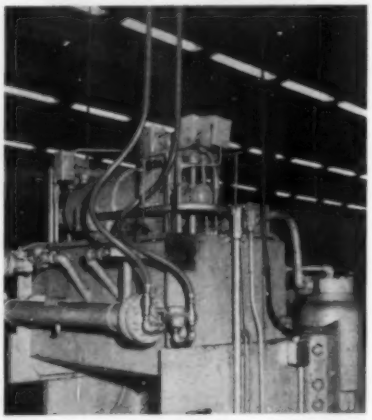
OPERATION—PRODUCTION

(O and P begins on page 56)

and greatly extended its service life. Tees similarly treated have been in operation over three years without failure.

Hose Replaces Pipe on Welder

By OTTO F. BOMBACH, Plant Engineer, All Steel Equipment Inc., Aurora, Illinois



Pipe and conduit are not used at All Steel Equipment Inc., Montgomery, Illinois, to hook up welding machines. Instead, plastic hose carries air and water and a rubber cable carries the power. In place of valves, quick disconnect shutoff couplings are used. Both hose and cable are held in place by Kellem's Grips, a form of Chinese finger which grips tighter under tension. Springs keep each line tight.

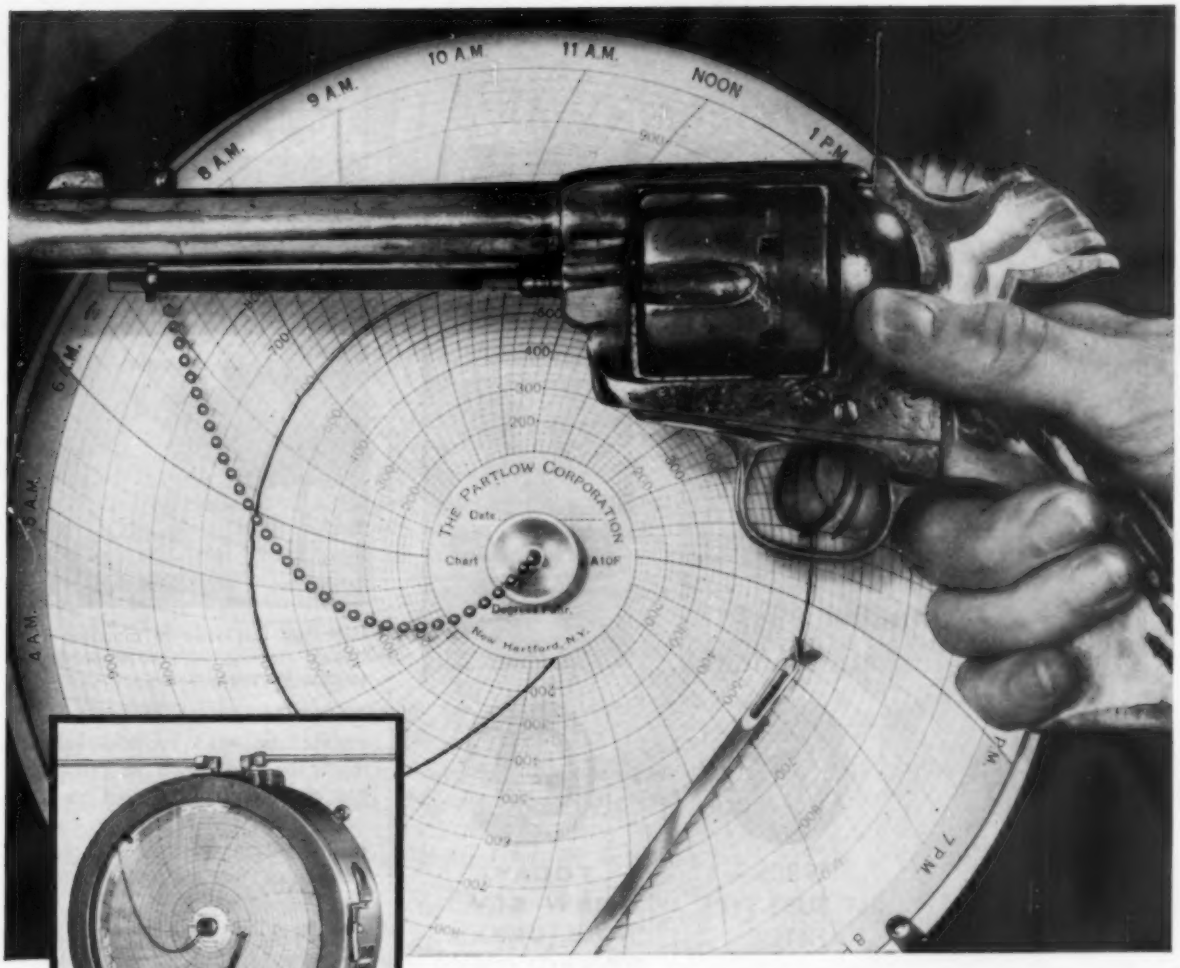
Luminaires Mounted on Tracks Solve Relamping Problem

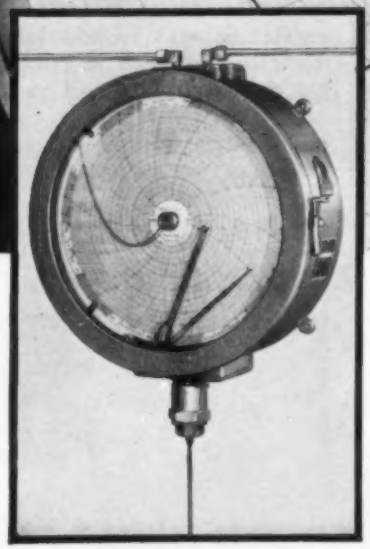
By K. CHEN, Electrical Engineer, Westinghouse Electric Corp. Bloomfield, N. J.

LIGHTING in our Gas House is provided by mercury lamps operating in luminaires mounted approximately 30 ft above the floor. These luminaires are located about six feet from a surrounding mezzanine platform and normally cannot be reached from this point.

However, by mounting the luminaires on a section of monorail track, they can now be positioned anywhere along the rail. Ballasts are mounted on a beam over the mezzanine platform and a cable is used to connect the ballast to the mercury lamp.

A two-foot section of the track overhangs the platform to permit





The Control Geared for

HAIR TRIGGER RESPONSE

even to Fractional Changes in Temperature!

NEW *Recording Pneumatic Temperature Control, Model RVA, available in any of 10 ranges from -30° to 1100° F.*

Extreme sensitivity—reflected in lightning-fast reaction to temperature changes—is a characteristic of *all* Partlow controls. Partlow Recording controls, however, *prove it in writing* . . . You can see for yourself how exceptional bulb sensitivity, teamed with advanced mechanical design, provide a minimum of "saw-toothing" on start-up, and maintain a rigid line of control when temperature reaches a predetermined set point.

Instant response, of course, is just one of Partlow's many built-in advantages. Another is rugged *design simplicity* that does away with hair springs and delicate electronic gadgets . . . that requires no electronic amplification . . . that permits fast, "screwdriver" replacement of the thermal element *right out in the field.*

If you use or manufacture process equipment within the –30° to 1100° F. range, there's a Partlow Pneumatic, electric or self contained gas control to fit your application *precisely*. Recording, indicating and non-indicating models available. For full details write The Partlow Corp., New Hartford, New York, Dept. PE-810.

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TEMPERATURE CONTROLS

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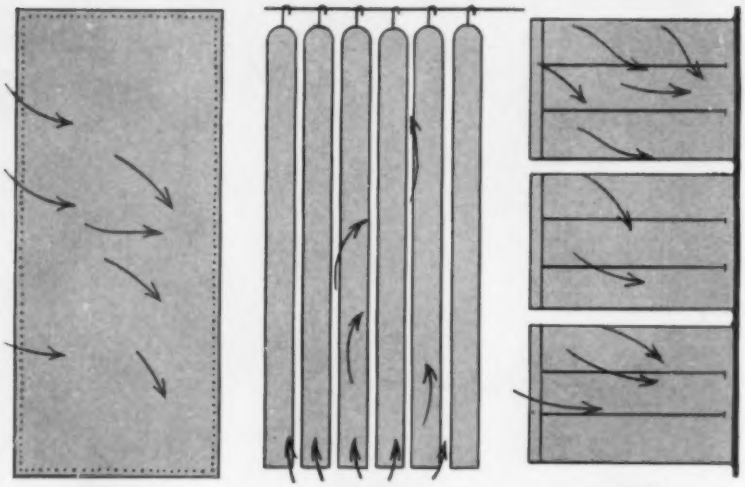
SINCE 1876 SLY

SLY DUST FILTERS For LONG BAG LIFE

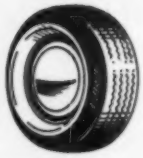


1900's SLY DUST ARRESTER

Cloth screens on wood frames were rigidly fastened to the dust arrester case, causing strain and excessive wear.

1930's SLY TUBE-TYPE FILTER

Certain areas of cloth tubes, particularly around the cuffs, bore the brunt of incoming dust-laden air, leading to premature failure. Shaking device also contributed to wear.



TODAY NEW SLY "ROLL-CLEAN" DYNACLONE®

"Resist-O-Wear" filter bags have 3-section design for greater strength. Spacer weight is distributed on 3 seams. Bags are cleaned by reverse air.

New Dynaclone Filter Bags Provide 2 to 3 Times Longer Life

New Sly "Resist-O-Wear" bags (patent pending) far outlast other types, as proved on the most demanding applications. In addition to basic bag strength, Dynaclone construction and low-velocity design insures even distribution of dust-laden air over the entire cloth area . . . there is no dust concentration at certain points. Dust is removed automatically by reverse cleaning air — no shaking, no abrasion.

The Dynaclone operates continuously, 24 hours a day if required. Uniform, constant suction at dust sources results in complete dust collection.

Sly Dust Filters provide 20 to 40% more cloth in a given space than any other type. Space saved means lower installation costs, simplified piping and ductwork.

There are more than 40,000 Sly Dust Filters in use, including over 1,000 Dynaclones. Investigate their advantages on your applications . . .

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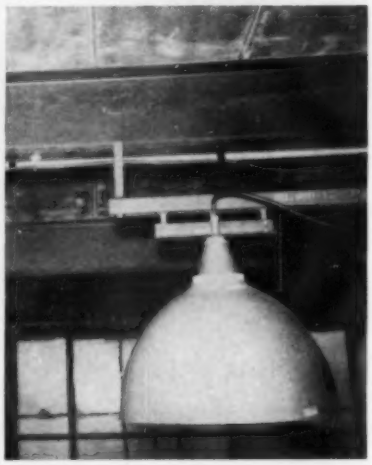
OPERATION—PRODUCTION

(O and P begins on page 56)



High-bay luminaire is mounted to a trolley, running in a 10 ft section of track, to permit servicing from platform.

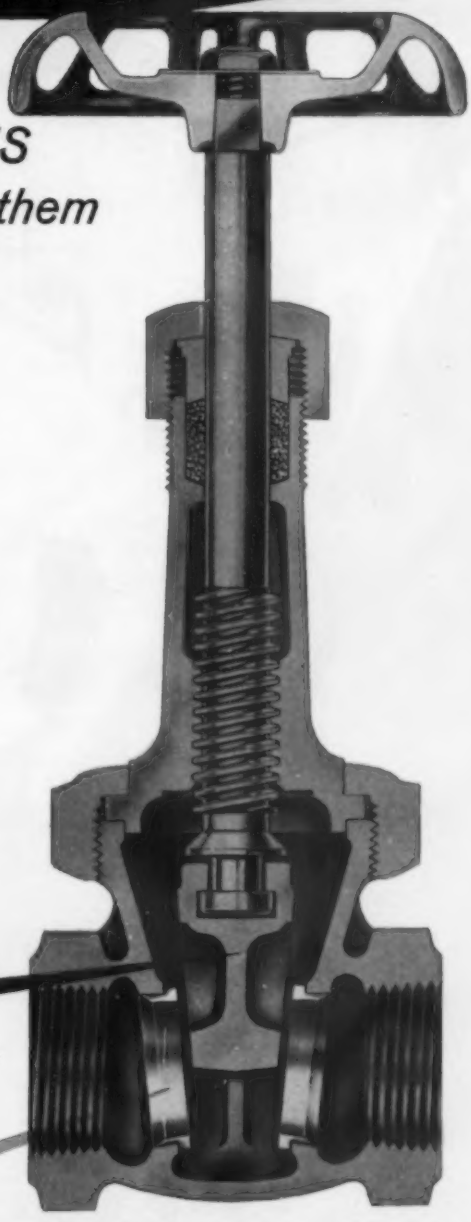
maintenance work, including relamping to be done from the mezzanine platform. With the aid of an ordinary stick, the luminaire can be positioned in its proper mounting location or over the repair platform.

Make Your Own Service Sink

By KEN BIDDLE, Plant Engineer, Sundstrand Aviation, Rockford, Illinois

Here is an idea you can use to reduce the cost of equipping your washrooms. It is a service sink that was built into the corner of the area, using materials available on the job. In addition to being less expensive than a regular service sink, it has the advantage of reducing lifting required when filling or emptying pails used by janitors.

It's Horse Sense . . . Why Chance Leaks in Seat Rings



Get Monel Seat BRONZE GATES made the way JENKINS makes them

It's plain horse sense that you had better have the Monel seat rings EXPANDED (ROLLED) into the valve body if you want them to stay tight and leak-proof.

More horse sense . . . there's nothing valuable lost through having seat rings that can't be replaced by a regular maintenance man . . . **IF** the bronze or nickel alloy wedge has a lower degree of hardness than the heat-treated Monel seat rings. *(The way Jenkins makes them)* Then, the wedge takes the wear and seat rings are relatively unaffected.

Obviously, there's no faster, simpler or cheaper way to renew tightness and efficiency than to slip on a new wedge. And that, plus renewal of packing as needed, is all you need do to assure good performance from Jenkins Monel Seat Bronze Gates for as long as you'll need to care. Good service for scores of years is common.

Long, low-cost life also results from greater-than-ever-needed strength in every part of these valves. The records of millions of Jenkins Bronze Gates show you get full protection against all the stresses encountered in use.

Your local Jenkins Distributor will quickly supply your needs from a wide variety of Jenkins Bronze Gates. For information about these valves, write for folder No. 181-C. Jenkins Bros., 100 Park Ave., New York 17.

WEDGE is less hard than seat rings. Wear affects this easily replaceable part . . . NOT seat rings

SEAT RINGS are expanded (rolled) into body. Permanent, all-around support is essential to prevent deforming, loosening, shifting, LEAKS

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

JENKINS SINCE 1864 Jenkins Bros

Sold Through Leading Distributors Everywhere

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Roy Lindeman, Purchasing Agent, and Al Krannich, Assistant Chief Engineer, of the Burt Manufacturing Company, Akron, Ohio, discuss Westinghouse products as applied to Burt fan-ventilator equipment with R. R. Burke, Salesman for Moock Electric Supply Co., Akron.

YOUR WESTINGHOUSE DISTRIBUTOR SALESMAN—

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A firsthand tour of your plant by a Westinghouse distributor can often bring on-the-spot, money-saving suggestions.

Frequently, your Westinghouse distributor can suggest new, improved products or offer advice on product applications. He may even suggest the use of a standard Westinghouse product to fit your "custom" installation, helping you ring up solid savings in money and man-hours.

Your Westinghouse distributor sees many electrical systems. He's in an excellent position to observe new Westinghouse products and techniques at work . . . and give you the benefit of his experience.

He will help you get the fastest delivery possible on electrical equipment you urgently need . . . or he will schedule delivery to suit your modernization or replacement plans.

Your Westinghouse distributor is ready with the most valuable product he can offer you . . . SERVICE. J-94140

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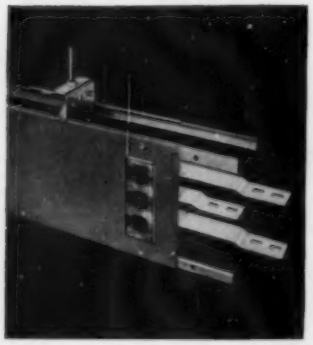
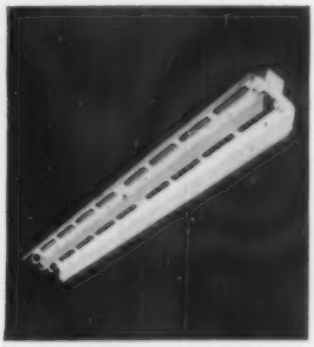
Here are three of the 17,000 items handled by your Westinghouse distributor:



Compact, lightweight, efficient Westinghouse bus duct installs fast and at low cost. Extreme flexibility speeds future expansion or plant layout changes. Available from your distributor to meet secondary power distribution needs.

Westinghouse capacitors improve power factor. Indoor dustproof capacitors seal out dust and lint, and guard against contact with live parts. Comply with NEC requirements. Your distributor can supply Westinghouse capacitors to fill any industrial application.



Economical Westinghouse CSO industrial luminaire uses super-high output fluorescent lamps. Unique "chimney" construction dissipates heat, creates updraft to keep unit clean, provides 20% uplight for visual comfort.

"Watch for the Westinghouse Industrial Apparatus Caravan"

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Tony Plonski says...

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No other known form of bituminous roof coating—when exposed to weather—will outlast Flintkote's Aluminized® Static Coating!

"Aluminized Static is a protective coating that gives all the high reflective insulating qualities of aluminum—PLUS the waterproofing and durability of asphalt static. Aluminized Static can't burn . . . doesn't stain or alligator-crack over any normal type of asphalt sub-surface. It retains its brilliance for five years and longer . . . and won't flow even in the hottest weather.

"Protective, long-life Aluminized Static Coating can be used—beautifully—on metal, masonry, glass or asphalt-covered surfaces."

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Industrial unit heaters and central furnaces

. . . the "big boy" of the Lennox line—the OG4 gas, oil or oil-gas industrial heater. It is available in up-flow, down-flo or horizontal models. It can be ordered with or without service platforms, blowers, dampers and filter boxes. The stainless and aluminized steel heat exchanger is designed for use with 100% outside air or an air conditioning unit placed upstream. Available in sizes from 280,000 to 2,000,000 Btuh input with on-off, hi-lo-off, or modulating burner control. The OG4 is especially engineered for make-up air and ventilation systems. This unit has air handling capacity of 16,000 CFM / 1,000,000 Btuh output.

Duct furnaces

. . . combined with damper and blowers are excellent for make-up air systems. They have both up and down stream limit controls, and can pass air in either direction. The aluminized steel heat exchanger is not affected by direct exposure to outside air. The GSDI is available from 120,000 to 420,000 Btuh input with either on-off or hi-lo-off control. Lennox blowers combined with the GSDI give a large range of sizes and air volumes to meet almost any need.

Landmark equipment

. . . a system of matched, commercial quality components that provide heating, cooling, air handling. Air mixing is provided by outside air dampers built as an integral part of the Landmark system. Each component is available in various capacities to provide exactly the right combination of heating, cooling and air handling. The components can be stacked vertically to provide up-flo or down-flo operation in a single unit. Landmark can be used singly or in multiples for multi-zone operation. Heat exchangers are aluminized. Landmark units operate at low sound levels and are completely insulated, making them suitable for installation in restaurants and other public buildings. Available from 68,000 to 340,000 Btuh gas input.

Horizontal oil furnaces

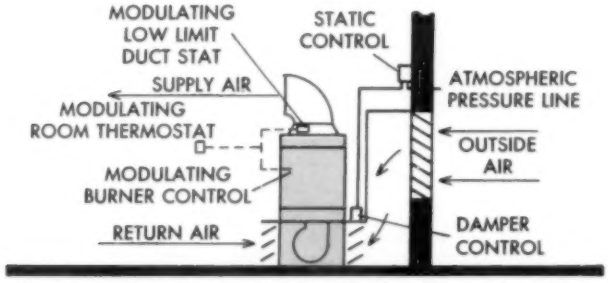
. . . where space is at a premium and capacity demands are not too great, the Lennox OS5 and OS6 furnaces are an ideal solution. These units have large capacity blowers and filters. They use stainless steel primary heat exchangers and are not affected by direct exposure to outside air. The dual limit controls on the OS6 provide guaranteed temperature protection, even in the event of a reverse flow condition. The horizontal oil units range from 119,000 to 350,000 Btuh input with constant ignition and two stage oil pump as standard.

DO YOUR BUILDINGS NEED MAKE-UP AIR?

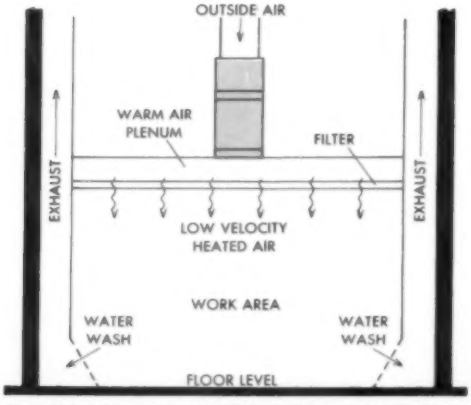
In many buildings an exhaust system pumps out contaminated air, leaving a negative pressure inside. Too often, replacement of this air is left to infiltration, which is highly inadequate. It starves the exhaust system by making it work against its own negative pressure, causes drafts and serious temperature control problems.

Lennox experience in make-up air systems can help you. Here are valuable tips:

- Usually you should maintain a slightly positive pressure within confined areas to prevent excessive infiltration and to insure proper operation of process work such as paint spray booths. Size the make-up air system to provide about 10% more air than is exhausted. Btuh output of the make-up air heater equals Cfm x 1.08 x difference between exhaust air and outside design temperatures.
- Introduce make-up air only when the exhaust system is operating. Use dampers to regulate the fresh air intake. There are three basic damper controls: Manual—low cost, but least desirable. Motorized damper interlocked with the exhaust system—use where exhaust volume is constant. Motorized damper actuated by a pressure sensing device—use where the exhaust volume varies.
- There are two preferred burner control types for make-up air systems: Hi-lo-off—used where close temperature control is not required. Modulating—used for close temperature control. For either type, a ductstat controls the discharge air temperature. If the make-up air heater also provides space heating, other controls may be needed.



Typical combined space heating and make-up air system.



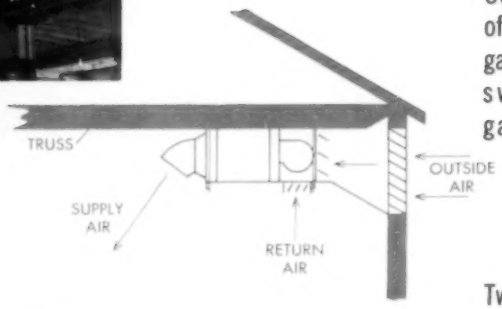
Typical paint spray booth make-up air system.

- direct-fired vs "wet" industrial heating
- heating and air conditioning
- **make-up air and ventilation**
- process work
- space heating

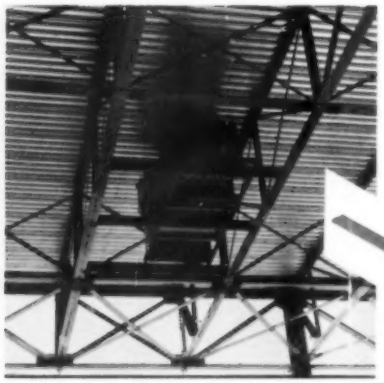
No. 3 of a Series

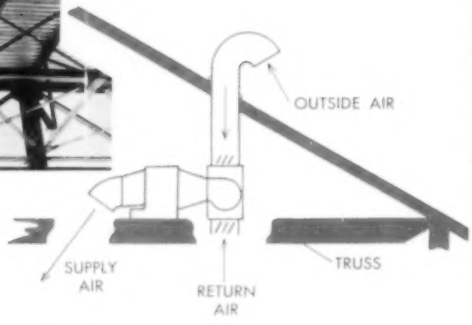
LENNOX
Commercial Equipment

Actual Installations of Lennox Make-up Air and Ventilation Equipment

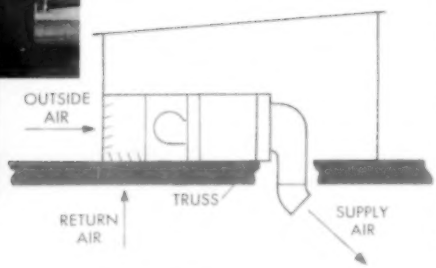


Four Lennox OG4 units provide space heating and make-up air for paint drying ovens in a large Iowa factory. They are suspended to save floor space. Dampers are coordinated with the drying ovens by a modulating motor and a time clock. OG4 units were used to take advantage of the lower rates for an interruptible gas supply. The OG4 provides instant switch-over between oil and gas with no burner changes.





Twenty-two Lennox GSDI duct furnaces combined with Lennox high capacity blowers and modulating dampers heat a Canadian factory and provide make-up air. Each duct furnace has 420,000 Btuh input and Hi-lo-off control. All units were factory assembled on frame rails and shipped to the job-site wired, piped, tested and ready for firing. This was extremely important as the installation was made in the winter, and temporary heating was required. The mechanical contractor was able to install and start up the units in record time.



Here, rooftop installation saves space and simplifies taking outside air into the system. It provides heated air to replace exhausted contaminated air in a Michigan plant which welds and fabricates steel. The dampers are controlled by a static pressure regulator and a modulating damper motor since exhaust air volume is not constant. The modulating gas-oil burner is controlled by a primary thermostat in the work area, and a secondary ductstat that senses the discharge air temperature.

LENNOX Industries Inc.

MARSHALLTOWN, IOWA • COLUMBUS, OHIO • SYRACUSE, N.Y. • FORT WORTH, TEXAS • LOS ANGELES, CALIF. • SALT LAKE CITY, UTAH
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FORM NO. IND.-603-M6

THE DENTS IN THE TUBE

give you more light with fewer lamps

New General Electric Power Groove* Lamps are certainly the queerest looking fluorescents ever made. But those dents are what make it possible for the G-E Power Groove Lamps to give you nearly *twice as much light* as the next most powerful fluorescent lamp type! And only General Electric can make them. General Electric makes its own glass (as it does *all* lamp components) and this engineering know-how has enabled G. E. to come up with the unique grooved design that lengthens the arc to give you extra light.

The same General Electric research that created this new years-ahead light source is giving you more and more light for your money in *every* G-E Lamp you buy —from the standard 40-watt G-E fluorescent, the most widely used fluorescent lamp type in the world, to the new smaller, whiter, brighter G-E 100-watt bulb.

Ask your General Electric Lamp distributor to recommend the best type of lamp for your lighting needs. General Electric Company, Large Lamp Dept. C-030, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

*General Electric trademark for its non-circular cross section lamp.

For more facts circle 551 on Reply Card

HOW THESE REGULATORS AND VALVES SOLVED A COSTLY GAS CONTROL PROBLEM

The manager of a small pottery had run into trouble in his glazing department. The gas flames used for glazing were erratic. This resulted in slow production and far too much spoilage. He also had trouble maintaining controlled heat in the kilns.

A Rockwell Field Engineer quickly diagnosed the difficulties as resulting from faulty pressure regulation. He checked and found old, oversized regulators in use. Checking further he learned that, because of valve leakage, it was necessary to keep the meter shed door open in order to dissipate the fumes.

The Rockwell man recommended using modern Rockwell pressure regulators and Rockwell-Nordstrom valves. Correcting all his troubles cost the manager only about $800.00. Later he gratefully said these products quickly paid for themselves in spoilage reduction and gas savings.

As you can see, precise pressure control doesn't cost a fortune. It can save money in any plant where gas is being used in quantity. The same holds true of liquid measurement. Rockwell meters can measure almost anything that flows through a pipe. They provide you with accurate records that will cut your costs, improve your end products or do both.

Rockwell as the world's largest single manufacturer of meters, regulators and lubricated valves, has a world of experience upon which you can rely. Why not have a Rockwell Field Engineer survey your plant to explore new approaches to cost cutting through measurement and control. There's absolutely no obligation, so send the coupon today.

ROCKWELL

The leading single source for Measurement / Control products and ideas

For more facts circle 552 on Reply Card

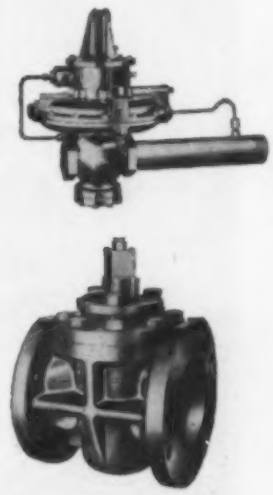
"IN-PLANT" METERING:

LIQUIDS AND GASES

Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES



More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.

HOW MUCH COULD YOU SAVE?

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. It will cost you nothing to have a Rockwell Field Engineer *show* you. Simply send the coupon below, now.

SEND COUPON NOW!

MEASUREMENT AND CONTROL DEVICES

all fine products by

ROCKWELL

Rockwell Manufacturing Company, Dept. MC2H, Pittsburgh 8, Pa.

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing

☐ Others: _____

Name: _____ Title: _____

Company: _____

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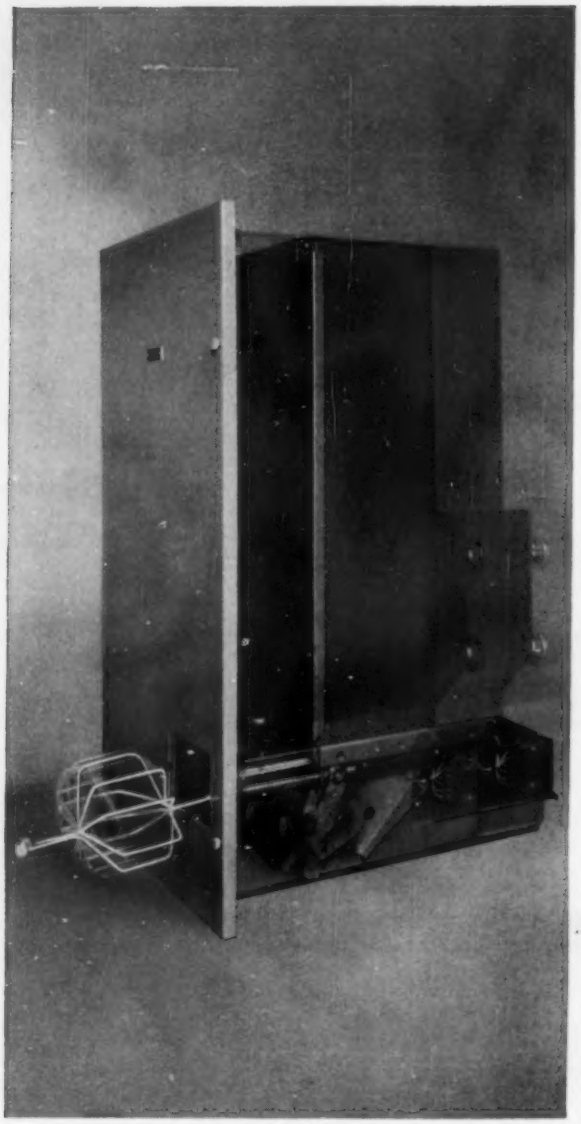
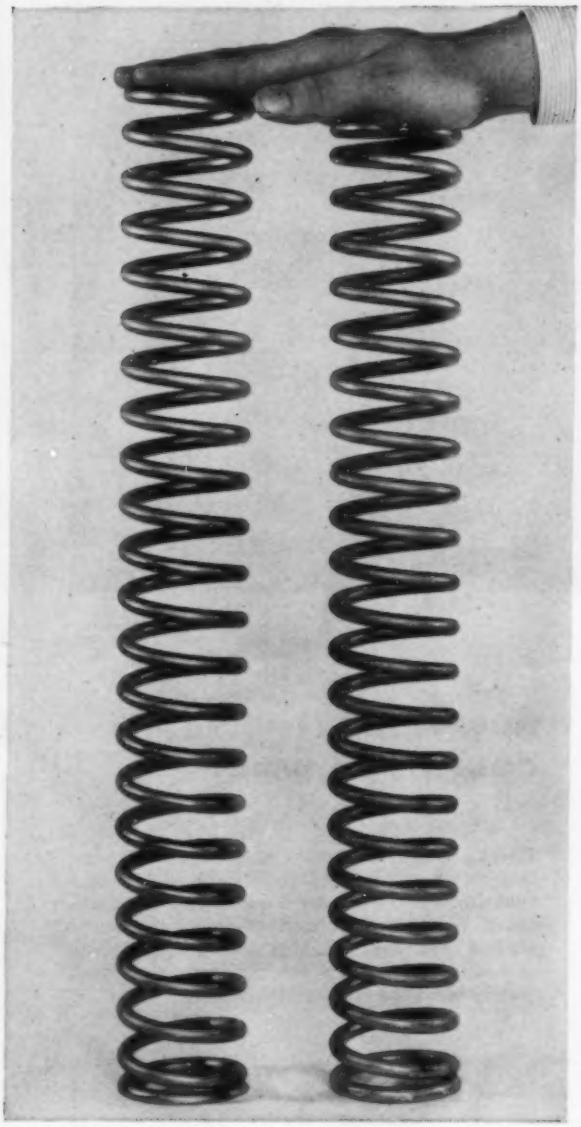
What New Metal-

Has closed-door drawout...



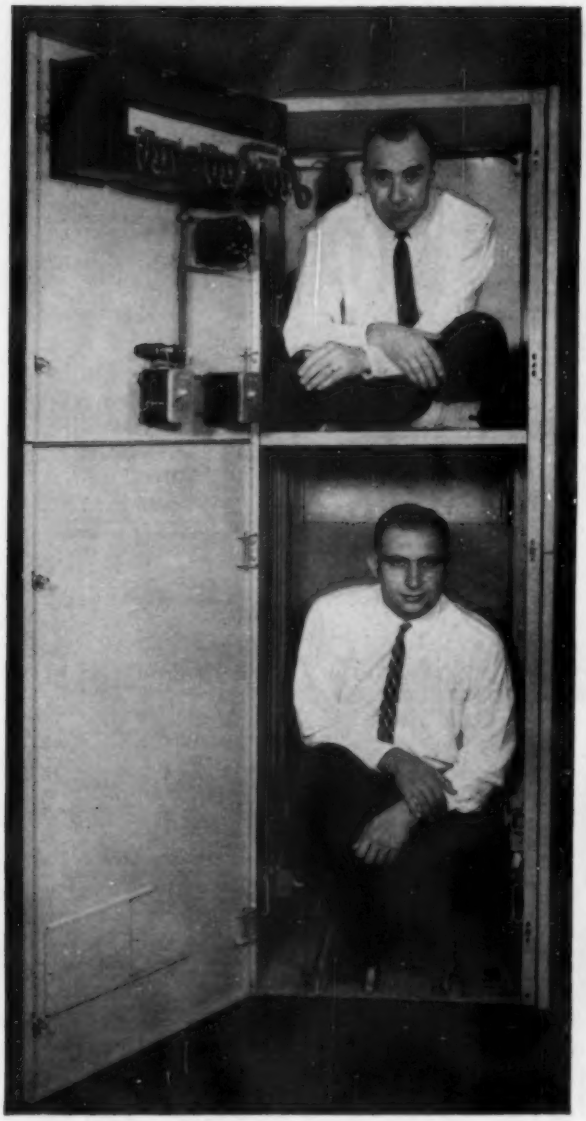
Stored energy as standard...



For complete answer, send for new illustrated Bulletin 2801-2A. And ask to see sound strip film that shows you every detail in only 18 minutes. Can be shown to you singly or to your group. Contact your nearby I-T-E sales office. Or write I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Phila. 30, Pa.

Clad Switchgear...

More elbow room inside...



Yet fits in tighter spaces?

I-T-E CIRCUIT BREAKER COMPANY

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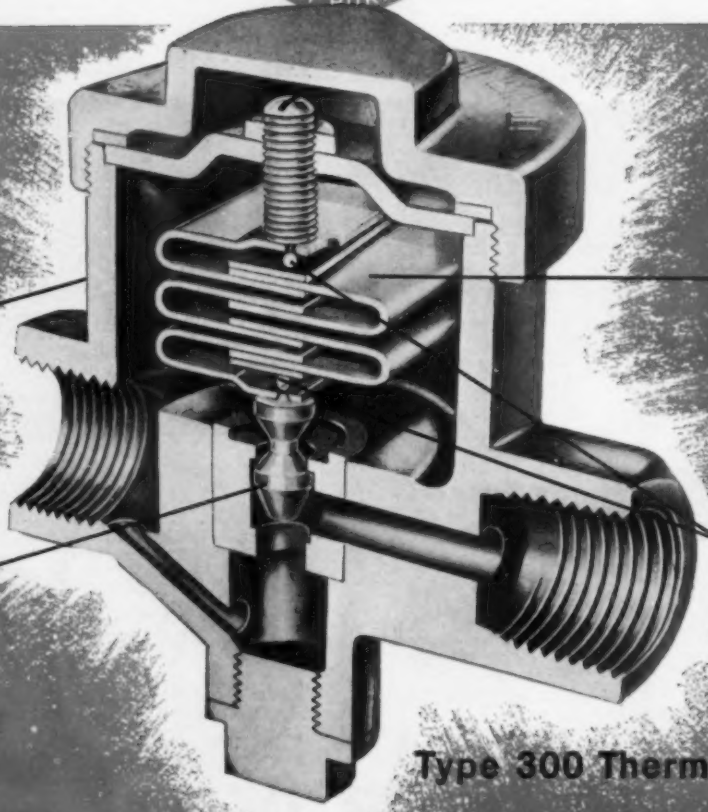
ONLY Farris MIL

PROGRESS THROUGH HONEST PURPOSE



FORGED MANGANESE BRONZE BODIES

Standard trap bodies (except the float models) are forged manganese bronze, selected for long life on steam. Aluminum bronze bodies also available.

HAND LAPPED PRESSURE BALANCED VALVES

Every Farris Mil valve is individually hand lapped to seat perfectly on the stainless steel insert. Valves are unaffected by pressure changes, respond only to temperature change.

INDESTRUCTIBLE BI-METAL

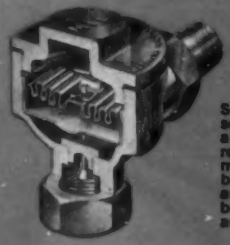
All Farris Mil trap bi-metallic thermal elements are high quality stainless steel. Cannot be damaged by water hammer, frost or corrosion. 2° sensitivity.

FRICTION-FREE FLOATING UNIVERSAL JOINTS

Bi-metallic element and valve cannot hang up or jam—no friction—no wear—no corrosion—no wire drawing—no maintenance.

Type 300 Thermostatic

3 MODELS . . . 9 TYPES



SELF-ADJUSTING THERMOSTATIC

Self-Adjusting models are factory set to release water and air from a steam system as well as to release condensate at a predetermined temperature. Available in 4 body patterns in 25 psi, 65 psi and 175 psi ratings, forged bronze bodies, stainless steel element and valve, aluminum bronze seat.

FLOAT THERMOSTATIC

Float type Farris traps provide rapid high capacity venting of air and cold condensate at start-up. Unique rocker design gives high mechanical advantage. Body is hi-tensile iron, all mechanical parts stainless steel. Available in 75 psi and 150 psi ratings.

EFFICIENT TRAPPING DEPENDS ON THERMAL CHANGE! SAVE WITH MIL THERMOSTATIC TRAPS FOR ALL PLANT-WIDE SERVICE

SEND FOR NEW CATALOG

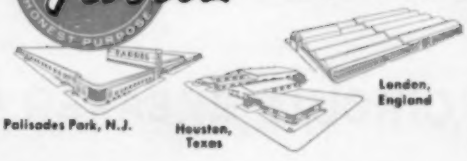
Free 8 page Farris Mil trap catalog #FE-310 gives complete dimensional data, performance information, and capacities for all 9 types.

Manufactured under patents, patents pending and licenses of Midland Industries Ltd., the largest producer of thermostatic steam traps in Europe.

Farris ENGINEERING CORP.

MIL DIVISION

557 COMMERCIAL AVENUE • PALISADES PARK, N. J.



AFFILIATES:
Farris Flexible Valve Corp. • Farris Engineering Ltd., London, England • Farris Universal Machine Corp. • Farris Combustion Controls Corp. • Midland Industries Ltd., Wolverhampton, England

STEAM TRAPS

are indestructible ■ will not wire draw ■ will not freeze up ■ cannot be damaged by water hammer ■ do not need a cooling leg ■ cannot corrode ■ operate instantaneously ■ are pressure balanced ■ have full floating, friction free, self aligning, stainless steel valves ■ cost less ■ are guaranteed two years

OVER A MILLION IN USE! TRY US—SEND YOUR ORDER FOR ONE OR MORE TRAPS. YOUR MONEY BACK IF THEY DO NOT PERFORM AS STATED!

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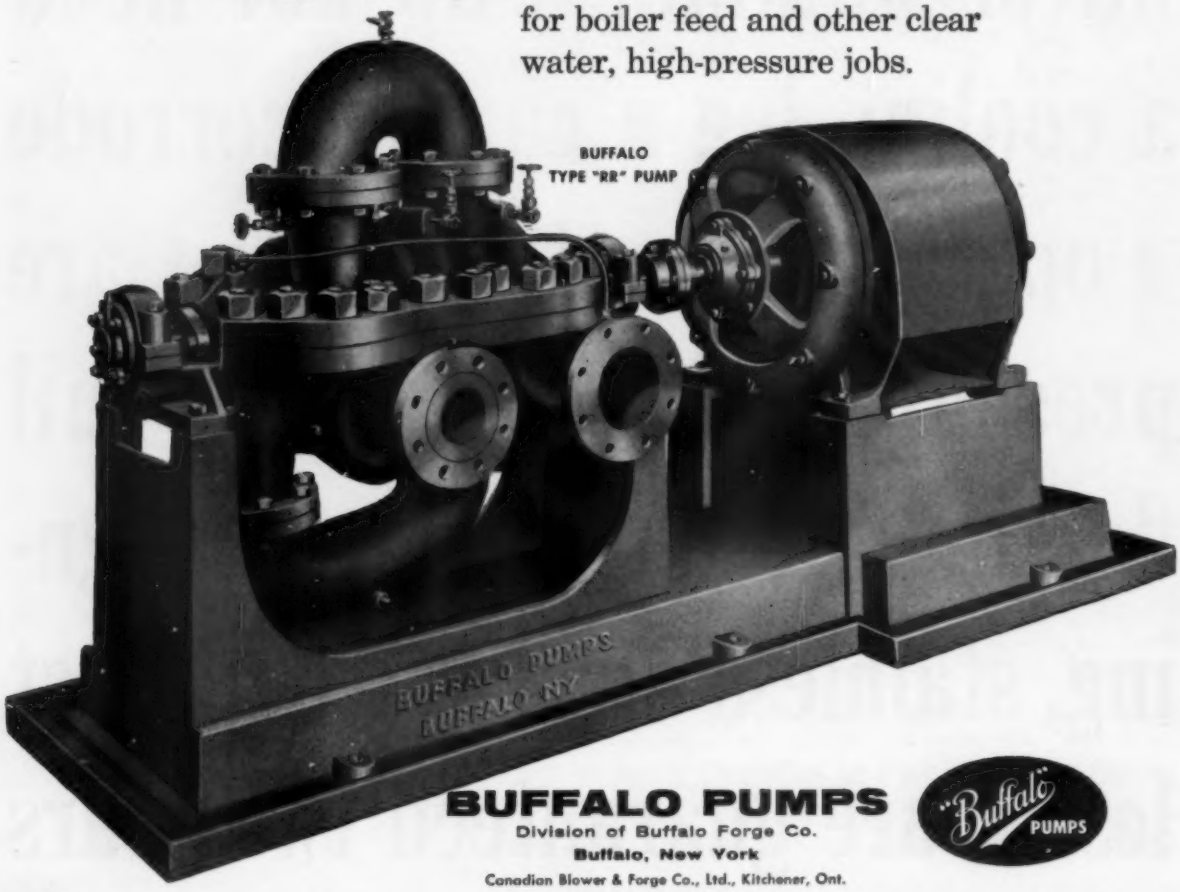
HIGH PRESSURE PUMPING

WITHOUT SACRIFICING EFFICIENCY! Write for Bulletin 980 and see how Buffalo combines efficiency with rugged strength in these 2 and 4 stage pumps for boiler feed and other clear water, high-pressure jobs.



BUFFALO PUMPS
Division of Buffalo Forge Co.
Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" PUMPS

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

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PLANNING CENTRAL AIR CONDITIONING?

BUFFALO HAS THE QUALITY UNITS

- to fit your plant layout.
- to deliver the exact climate you need.
- to insure low maintenance operation.

EXCLUSIVE ADVANTAGES OFFERED IN BUFFALO CABINETS

FAN WHEELS are of the Mixed Flow type with non-overloading horsepower characteristics. No need to oversize motor. Made of aluminum for reduced weight, corrosion resistance.

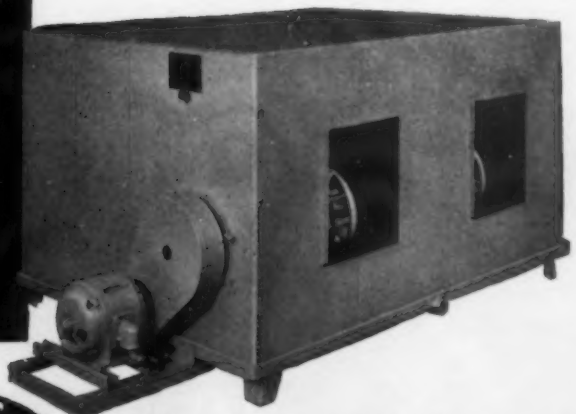
SHAFTS are oversize hollow type for perfect balance and operation well below critical speed.

BEARINGS are ball type, externally mounted for convenient maintenance.

CASINGS are removable; of heavy gauge galvanized sheets.

COILS are the highly efficient Aerofin brand.

ACCESSORIES offered include: filter boxes, dampers, mixing boxes, humidifiers and moisture eliminators.



Types PC & VPC — dry coil units for horizontal or vertical mounting. Types PCW & VPCW — wet coil units for horizontal or vertical mounting. Write for Bulletin AC-121.

"Buffalo"

BUFFALO FORGE COMPANY

Buffalo, New York

Buffalo air handling equipment to move, heat, cool, dehumidify and clean air and other gases.

Buffalo Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

Buffalo Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

For more facts circle 556 on Reply Card

Why 7 economy-minded engineers chose Transite Pipe to cut costs of moving water, power and gases!

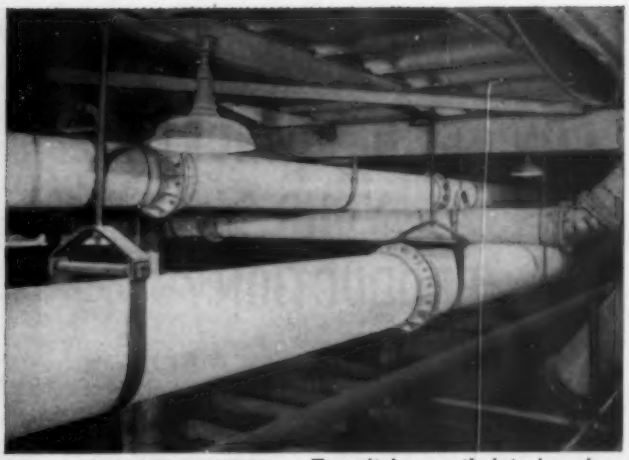
In every area of industrial piping, Transite® saves you money from time of purchase right on down through the years. Made of tough, durable asbestos cement, this "white pipe" has gained the acceptance of economy-minded plant engineers throughout the country. Available in economical lengths and diameters, Transite features easily-installed, permanently-tight couplings. Non-tuberculating, non-conductive, corrosion-resistant Transite keeps your systems operating smoothly and economically while requiring minimum maintenance. Learn how Transite's unique properties solved seven key piping problems.

HIGH WATER-CARRYING CAPACITY — Here Transite is being installed for pressure and fire lines by one of this country's largest metal companies. Transite resists tuberculation and electrolysis . . . maintains its high water-carrying capacity through the years.

RESISTS CORROSION — Transite, made of durable asbestos cement, resists the corrosive action of salt water and cinder fills. It is the choice of leading companies for salt water gathering and disposal lines.

NEW ECONOMIES — For storm water drainage and storm sewer systems, Transite provided a 25% savings in this new floor tile plant.

USED INDOORS OR OUT — Transite Industrial Vent Pipe — shown in the H. J. Heinz Research Center — saves on upkeep . . . resists attack by most gases, mists, fumes and dusts.



SMOOTH INTERIOR — Transite's smooth interior gives maximum resistance to sliming and bacterial growths. That's why the St. Regis Paper Company picked Transite for process water and stock lines.

WITHSTANDS AGGRESSIVE LIQUIDS — In the mining of copper and coal, a dual pipe system of Transite at Inspiration carries fresh water and removes tailings in suspension ranging up to 54% solid. Transite has an enviable record withstanding such aggressive liquids.

COOLER CABLES — Transite Ducts provide permanent service for underground power transmission and distribution lines. They do not deteriorate from heat, water or corrosive soil, and they dissipate heat faster. Cables run cooler, carry greater loads. Used by largest airports, public utilities and industries.

LEARN HOW YOU CAN HAVE THE ECONOMIC BENEFITS MAJOR COMPANIES ENJOY SINCE THEY INSTALLED TRANSITE PIPE. FILL IN AND MAIL THIS COUPON TO:

JM PRODUCT JOHNS-MANVILLE Box 14 PE-8, New York 16, N. Y. In Canada: Port Credit, Ontario

Without obligation, please send information on Transite for plant piping. I am interested in:

- water supply lines ☐
- fire lines ☐
- industrial and sanitary waste lines ☐
- process lines ☐
- industrial vent pipe ☐
- subsurface drainage pipe ☐
- irrigation pipe for landscaped areas ☐
- electrical conduits ☐
- storm water drainage and storm sewer systems ☐

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

For more facts circle 557 on Reply Card

CAN COLOR CONDITIONING INCREASE YOUR PRODUCTION?

Yes. But let's ask a specialist like Bob Bird. Bob is one of Du Pont's staff of "Color Counsellors"—sales representatives whose years of experience and specific training qualify them to bring you expert, on-the-spot assistance in selecting the right paints in the right colors. Here's his answer:

"There's more to this question of effective maintenance painting than many people realize. Of course, it starts with the selection of top-quality finishes. My customers know their investment in Du Pont paints will pay off in terms of long-lasting protection and good appearance.

"But the job's only half done if you stop there. For maximum return on your maintenance dollar, Du Pont's system of Color Conditioning is a *must*. Tests show conclusively the power of color, scientifically applied, to make employees happier, safer and more productive. Du Pont Color Conditioning lets you harness this power to work profitably for you. By reducing absenteeism, boosting efficiency and promoting safety, Color Conditioning can literally increase your production!"

Bob Bird, or any of his counterparts throughout the country, would be happy to talk with you before you write your next paint specifications. For more information, plus the 28-page booklet, "How to Put Color to Work," write: E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Dept. PE-68, Wilmington 98, Delaware.

* * *

R. H. Bird has developed plenty of problem-solving experience in the field of maintenance painting during more than 20 years with Du Pont's Finishes Division. Enthusiastic about its many possibilities for more efficient maintenance at lower cost, he has developed Color Conditioning programs tailored to meet the needs of a wide variety of schools, hospitals, churches, office buildings and industrial installations. A member of the Construction Specifications Institute, Bob works closely with architects drawing up paint recommendations.

DU PONT COLOR CONDITIONING PAINTS

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

For more facts circle 558 on Reply Card

COURT DECISIONS —a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Royalty Payments

UNDER A CONTRACT with the inventor of a detergent dispensing machine the manufacturer could lease the machines for a period of one year with an option to purchase the machines, the patent and the trade name.

By another agreement the inventor was employed by the manufacturer as a salesman, with the further provision that if the option were exercised by the manufacturer, the inventor should receive five per cent of the net profits so long as the manufacturer leased the machines or used the trade name.

As a consequence of a dispute, the inventor resigned as salesman and sued the manufacturer. The court held that under the provisions of the contract the manufacturer would pay the inventor a percentage of the net sales so long as the machines were leased, the manufacturer could terminate its liability by ceasing to use the machines.

"It must be held that the manufacturer is obligated to pay royalties on the net sales of all the trade name products as long as it leases the machines or uses the trade name." Court brief 189 N.Y.S. 2d 630, New York, August 13, 1959.

Employee's Assumption of Risk

WHILE WORKING on the installation of a housing unit over the pump of an oil well, an employee of an independent contractor lost his balance and caught his arm in a V-belt.

Ordinarily guards were installed when the engine was ready to operate and before the housing over the engine was erected. In this instance, however, that had not been done as the pumping unit had lacked the guards when it had been received, and it had been operated without guards for approximately three weeks.

In the suit brought by the employee of the contractor against the owner of the premises, the Federal District Court held he could not recover damages for this injury.

The court stated, "The owner must use reasonable care to keep the premises in a reasonably safe condition and give warning of latent or concealed perils.

"But the owner is not liable when the injuries result from a danger obvious to the injured party. If there is a danger attending upon such entry or upon the work which the person invited is to do thereon, and such danger arises from causes or conditions not readily apparent to the eye, it is the duty of the owner to give such person reasonable notice or warning of such danger.

"But such owner is entitled to assume that such invitee will perceive that which would be obvious to him upon the ordinary use of his own senses. He is not required to give to the invitee notice or warning of an obvious danger." Court brief 174 F.S. 757, Montana, July 6, 1959.

Salesman's Commissions

EMPLOYMENT CONTRACT of a salesman provided for payment of commissions at 6½ per cent of his sales with the stipulation, "No commission shall be payable in respect to sales or shipments or orders subsequent to termination of sales employment, for any reason."

In a suit by the salesman against his employer, he claimed commissions on orders aggregating $85,577.90 that had been received by the employer during his employment. Shipment on these orders had been delayed until he had been discharged.

This contract clause was interpreted by the United States Court of Appeals as follows "It seems quite proper to say that the sentence means the employer was not to pay for shipments on orders (received) subsequent to termination. And the corollary would follow that the salesman was to be paid on shipments or orders received before the time employment ended. And certainly it is unusual to deny a man payment for that which he has produced as a salesman." Court brief 268 Fed. 2d 936, California, June 30, 1959.

Manufacturer Absolved

SUIT WAS BROUGHT by the purchasers of a heating and air conditioning system against the manufacturer. A local contractor of this equipment had advertised, "The unit is entirely assembled in the manufacturer's plant where all of its major parts are manufactured. Thus, you are assured of undivided responsibility for dependable operation."

This advertisement, the purchasers maintained, was a covenant in the contract made by them with this manufacturer. The system had failed to function properly and on that basis they demanded damages from the manufacturer.

Holding that no liability was chargeable against this manufacturer, the court referred to a famous decision in which it had been said: "If the nature of a thing is such that it is reasonably certain to place life and limb in peril when negligently made, it is then a thing of danger. Its nature gives warning of the consequences to be expected.

"If to the element of danger there is added knowledge that the thing will be used by persons other than the purchaser and used without any tests, then, irrespective of contract, the manufacturer of this thing of danger is under a duty to make it carefully."

In its refusal to adopt the argument of the purchasers and hold the manufacturer liable for damages, the New York court said, "Since this company did not make repairs and there is no privity between it and these purchasers and this is not an inherently dangerous product so as to come under the law of this decision, no liability arises as to this manufacturer, merely because it manufactured part of the heating and air conditioning system." Court brief 190 N.Y.S. 2d 24, New York, July 28, 1959.

Crane Operator Negligence

FOR SEVERAL days a workman had been welding and painting brackets for a conduit in a rod mill while the mill continued in full operation and activity. On the morning of the accident this workman, after two hours on the job, decided to come down from the scaffold on which he had been working.

The ladder was clear of a nearby crane. Glancing at the crane he saw it motionless, its signal lights out and no sign of activity. With his paint pail in one hand he stepped on the ladder and grasped the crane rail with the other hand to steady himself.

At that moment a crane wheel rolled onto his hand. No warning of the approach of the crane was given; no bell, no siren annouced the approach. The steel company appealed a judgment in favor of the injured workman.

In affirming that judgment, the Supreme Court in Pennsylvania said,

COURT DECISIONS

"The duty to make the premises reasonably safe or to warn of dangerous conditions existing or about to occur by the operation of the machinery was not honored.

"It must be remembered that when he commenced to descend the ladder, the crane was not in operation and, suddenly, without warning, it moved forward. The need to grasp something to steady the ladder does not constitute an act of contributory negligence such as would warrant us in declaring it to be so as a matter of law." Court brief 155 Atl. 2d 201, Pennsylvania, November 9, 1959.

Goods Damaged in Transit

ORDER FOR THREE transformers at a total price of $9,810, was placed with an electric company with the stipulation that these transformers be shipped by rail. However, the order of the electric company to the manufacturer for this equipment failed to specify that shipment should be made by rail. As a consequence the shipment of the transformers was made by motor truck. En rou'e the transformers were damaged, and when they were offered for delivery, they were refused by the purchaser.

The seller sued the carrier. The carrier contended that the goods upon their delivery to the carrier were no longer the goods of the seller but the property of the buyer.

The court ruling stated, "The court is satisfied that it was the intention of the parties that title to the transformers should remain in the seller until accepted by the purchaser unless delivered by the prescribed carrier, which they were not. Thus the title to the transformers was vested in the seller when the carrier received them from the manufacturer and the risk of loss and the right to recovery was in the seller." Court brief 175 F.S. 43, Michigan, August 6, 1958.

Essentials of Trade Secrets

SUIT WAS brought by a farmer against a manufacturer in which it was charged that new and novel ideas for the mounting of a corn picker on a tractor had been disclosed to representatives of this manufacturer. These ideas were later incorporated by the manufacturer in its products.

Granting judgment to the manufacturer and absolving it of the liability charged in the action, the Federal court said,

"He must establish that the ideas which he claims the manufacturer acquired by trick, were sufficiently new and novel that his claimed ownership in them entitled him to legal protection.

"It must be established not only that the new and novel ideas were acquired by artifice but that the ideas so acquired were subsequently used by the manufacturer. All three elements—a new and novel idea, fraudulent acquisition and subsequent use by the manufacturer—are essential to the claim for relief." Court brief 122 U.S.P.Q.570, Indiana, January 27, 1959.

Conspiracy Charge

A MANUFACTURER of gas furnaces sued gas utilities, burner manufacturers and a trade association, accusing them of an illegal restraint of trade in marketing of gas appliances.

As a consequence of this conspiracy, the manufacturer asserted, it was impossible to successfully market gas equipment without the approval of this gas association since the utilities refused to supply gas for equipment not approved by the association.

The United States District Court dismissed the action with the statement, "But injuries to the party complaining is not enough upon which to predicate such an action.

"There must be harm to the general public in the form of undue restriction of interstate commerce. An appreciable part of such commerce must be the subject of the monopoly, restraint or conspiracy.

"The statements of this manufacturer fail to establish that there has been any appreciable lessening in the sale of conversion burners of gas or gas furnaces or that the public had been deprived of a product of overall superiority." Court brief (C.C.H.) 1959 Trade Cases 76,171, December 3, 1959.

Antitrust Charge Dismissed

A FABRICATOR of structural steel charged a steel company with conspiring with a railroad company to prevent free and competitive bidding on railroad contracts in violation of the Federal Antitrust Act.

By the Clayton Act it is required that a common carrier engaged in interstate commerce hold competitive bidding when purchasing goods or supplies from any seller which has on its board of directors a person who is also a director of the common carrier. During the period involved in this controversy a director of the railroad company was also a director of the steel company.

The Federal District Court dismissed the action with the statement, "The fact that the railroad company accepted the steel company's bids on certain jobs, although such bids were not in dollar amount the lowest of the bids submitted, will not support any inference of conspiracy between the steel company and the railroad or any wrongdoing by the steel company.

"Section 10 of the Clayton Act requires the carrier to accept the 'most favorable' rather than the lowest bid and the uncontradicted testimony was that the bid of the steel company in each instance where it was accepted, was, under all the circumstances, the most favorable to the railroad.

"In essence, the legal contention is that this section of the statute should be so construed as to require a supplier which has a common director with a carrier, to sell steel or other material to any and all persons who wish to compete against such supplier in bidding to the carrier. There is nothing in the statute, its legislative history or the regulations of the Interstate Commerce Commission to support such an interpretation of the statute." Court brief 177 F.S. 743, California, September 30, 1959.

Covenant Against Competition

LITIGATION between an employee and his employer was settled by the execution of an agreement by both parties. This agreement contained the provision that the employee, for a period of two years after the signing of this contract, would not compete or assist anyone to compete with the employer in any business relating to the employee's former employment, and not to divulge to anyone any trade secrets or confidential information.

During the following two years the employee was actively engaged in this field of engineering in violation of the covenant. Suit for damages and an injunction was brought by the employer. In its decision in favor of the employer, the Federal court said,

"Where, as the result of a breach of confidence, a former employee has acquired and sought to patent ideas or inventions developed by his former employer, he may be compelled to relinquish all rights to such property which he has wrongfully acquired.

"In such cases the courts will hold the wrongdoer to be a constructive trustee of the property misappropriated and will order a conveyance by the wrongdoer to the former employer." Court brief 176 F. S. 104, New York , July 30, 1959.

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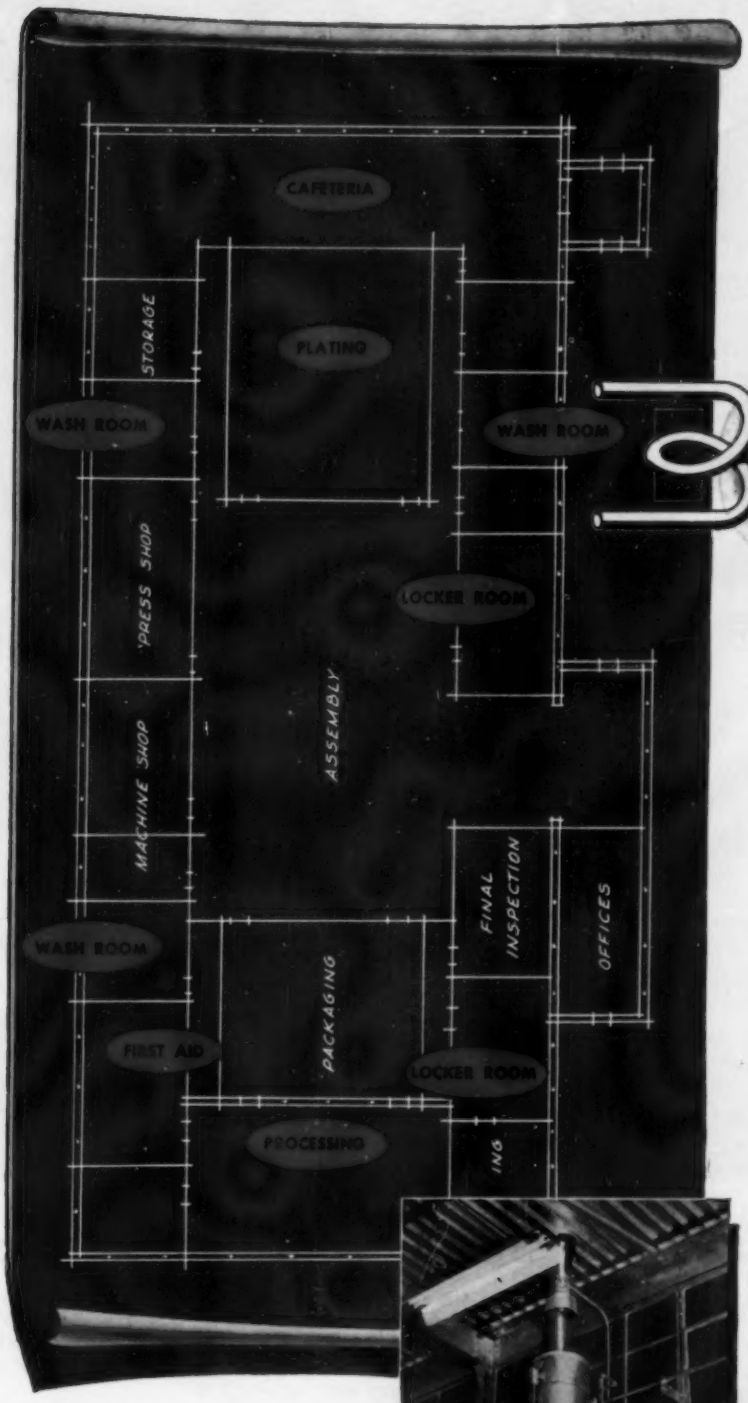

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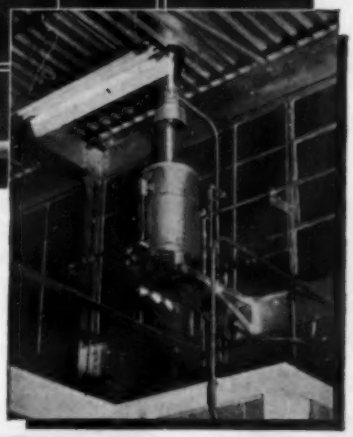

Far from being centralized, most industrial hot water needs are usually scattered throughout the plant.

Not only that, but it's more than likely that each application has its own specific requirements with regard to volume, temperature and "peak load" characteristics.

That's why more and more industrial operations are including *Burkay* gas-fired water heaters in their modernization plans. One or more *Burkay* units can be easily "spotted" at each point-of-use . . . to provide maximum flexibility, a dependable supply of right-temperature hot water for each specific need, and substantial savings due to the elimination of costly piping losses and inefficient "small-load" boiler operation.

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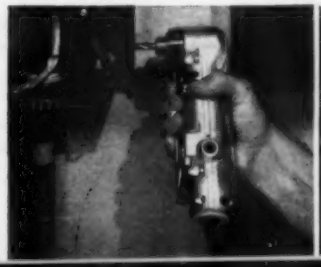

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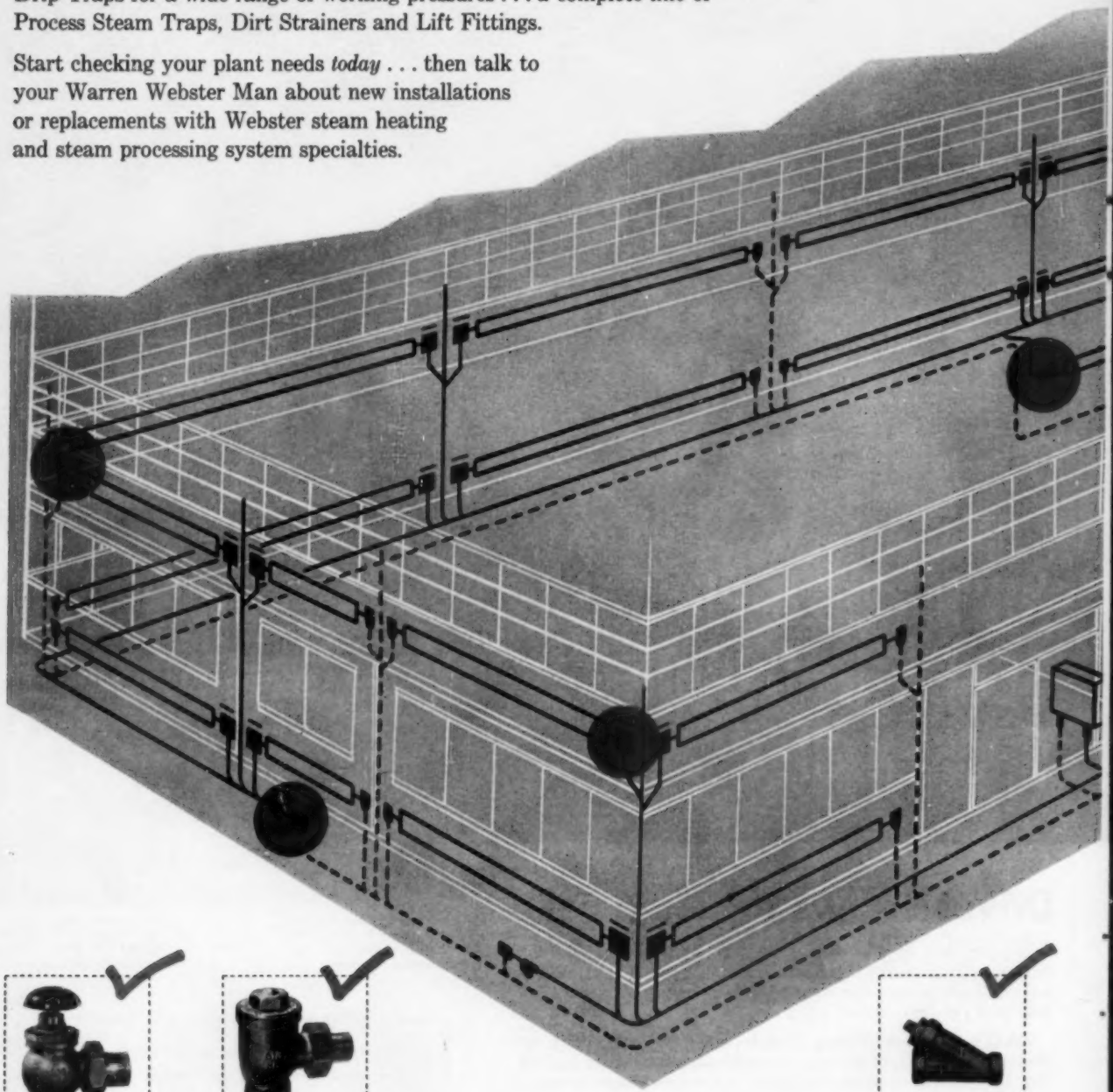
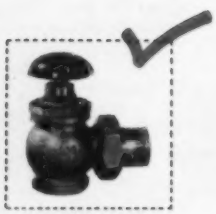
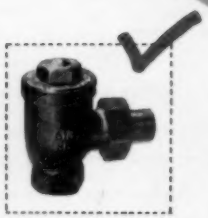
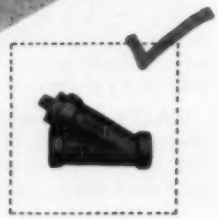




Ser. 600S Sylphon Bellows Radiator Supply Valve



Ser. 5 Sylphon Thermostatic Trap



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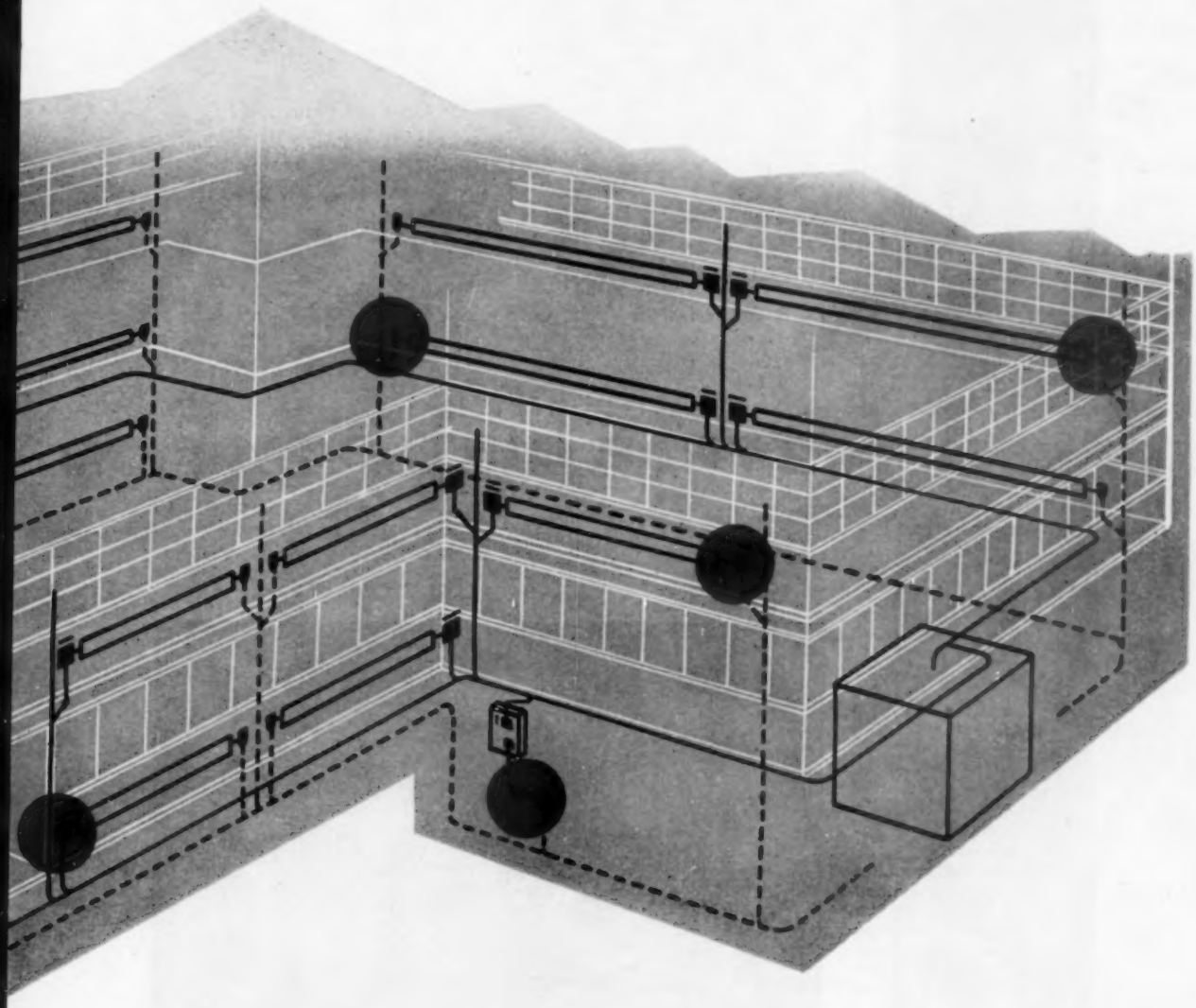

Ser. 10 Radiator Valve

Ser. 7 Thermostatic Trap

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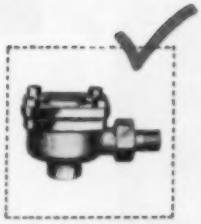

Process Steam Trap

Thermostatic Drip Trap

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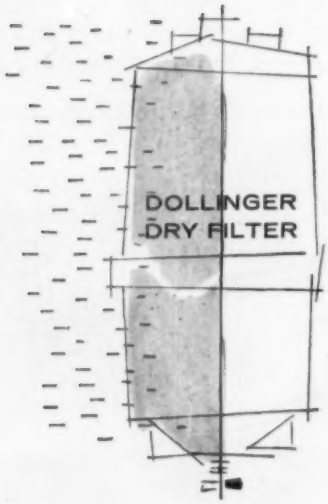

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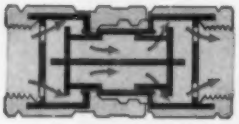

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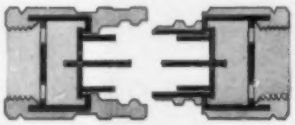

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"H" series valved couplings for high pressure applications. High resistance to heavy line surge. Sizes from ⅛" through 6". Larger sizes on special order.

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WHAT'S JUST AHEAD IN THIS ISSUE?

- HOW MUCH "mileage" is your plant getting from each gallon of water? If water is being wasted, then your company, like a lot of others, is heading for trouble. A study of water usage may reveal some good possibilities for savings. For conservation ideas turn the page to find out how one company reduced its daily water consumption sharply in spite of expanding production.

- CENTRIFUGAL SEPARATORS can be called upon to handle a number of jobs in your plant—they can purify oils, clarify coolants, extract cutting oils, among other applications. However, with several types of centrifuges available, the article beginning on page 103 tells you which type does each job best.

- PLANT SERVICES, such as electricity, steam, and air are often ignored after the plant has been in operation for some time. But this does not mean that they are efficient or doing the job that is required of them. The story of how Bendix Aviation acquired a plant in Hamilton, Ohio, then went about surveying the utilities there and improving the service, is told on page 107.

- PNEUMATIC SYSTEMS will operate much better if most of the moisture is removed. This can be accomplished by using a dehydrator. The location of this unit in relation to the over-all pneumatic system is important. For a full explanation of several ways in which you can use a dehydrator, turn to page 112.

- FILTER ELEMENTS can be cleaned by backflowing, solvent-washing, scraping or removing the unit for soaking or scrubbing. The question is "Which one best fits my operation?" To help answer this question, the article on page 121 discusses each cleaning method and recommends where it should be employed.

- WHEN YOU specify a centrifugal pump, how concerned are you about the type of impeller that it should have? And how closely do you weigh the problem of possible overloading? For a detailed discussion of these design criteria, refer to the article on page 128.

- GOOD DESIGN of shipping dock facilities is essential, since every plant must ship and receive materials and finished goods. Basic requirements and dimensions for both truck and railroad docks and their accessories are discussed in the article beginning on page 140.

GM CONSERVES WATER

With Plant Practices That Reduce Waste

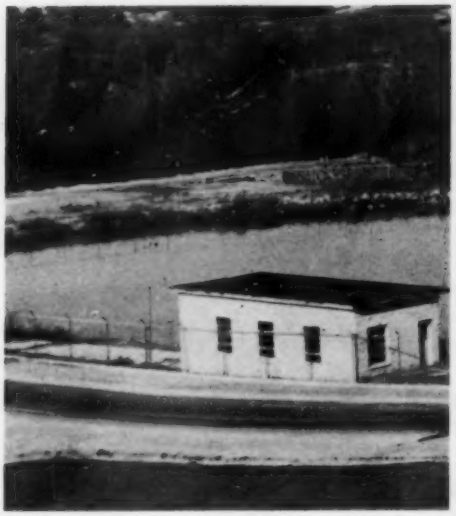


Fig. 1. This nine million gallon pond is used for circulation and cooling of process water at aluminum foundry.

THE NECESSITY for conserving water in its operations became more apparent to General Motors after World War II. Demand for water was increasing and many areas and communities were hard pressed to meet the needs of industry. Construction of new plants and expansion of old ones had taxed existing water supplies, and plans for new plants were decidedly affected by considerations of water supply.

GM plant engineers found it necessary to develop programs for water conservation in their divisions, and have demonstrated real ability and ingenuity in meeting this situation.

In 1957, which can be taken as a reasonably good year for industrial operation, General Motors used 72 billion gallons of water in its plants in the United States and Canada. This quantity would have been much greater had it not been for determined efforts for conservation by the plant engineers.

Organizational Steps—Typical steps in organizing a plant water conservation program include:

1. A general but detailed survey of water use in the plant.
2. Establishment of minimum water flow necessary for each piece of equipment.
3. Education of plant personnel to recognize the need for water conservation and to understand the methods of cutting down of water use.
4. Substitution of other materials or processes for water cooling.
5. Recovery and reuse of water.
6. Reduction of quantities used.

For most heavy manufacturing it has been found that these steps toward water saving can be applied in three broad areas of activity. These are: in cooling water applications; in the use of water for heating; and in general processing which makes use of water in contact with the product.

The cooling processes used by General Motors include those necessary for the operation of such equipment as welding machines, die casting machines, rectifiers, plastic molding machines, and air compressors. They would also include water for heat exchangers for control of temperature of processes, such as electroplating and anodizing.

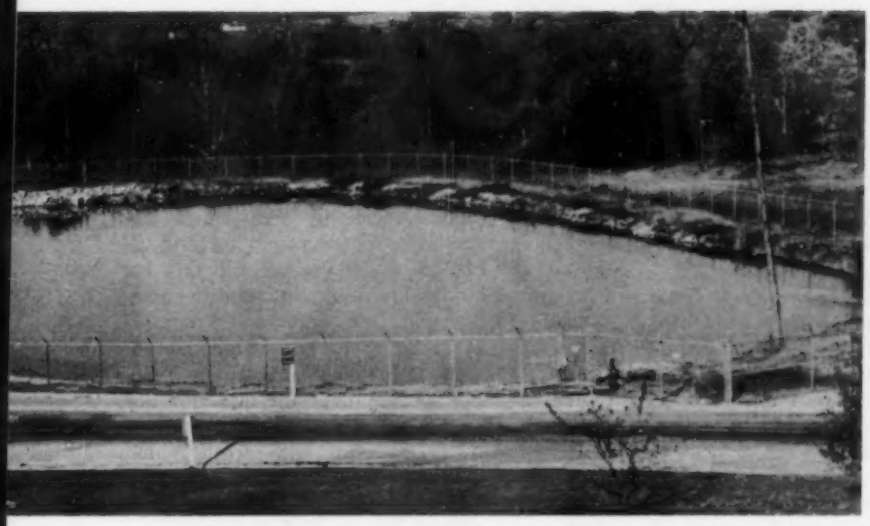
Recirculating Systems—Most GM plants are using recirculating water systems for the supply of water to cooling equipment. Besides cutting down the amount of water necessary for this operation, this procedure minimizes maintenance and operating problems due to accumulation of scale and corrosion deposits in the equipment. Water used on a once-through basis cannot be chemically treated economically for the control of these deposits. The use of the recirculating system provides the opportunity to apply this type of control.

An example of one recirculating method is the installation of intermediate heat exchangers in a closed system in which the water used for cooling a process is obtained from a demineralized supply or is steam condensate. The cooling water for the heat exchanger may be treated city or well water and is circulated through a spray tower. This system may appear to be extravagant with respect to the investment involved, but the reductions in equipment failure, downtime of productive equipment, and maintenance expense more than compensate for the added investment and utilities cost.

In one GM plant, in the year of 1957, nearly two billion gallons of water were supplied by the tower, while only 83 million gallons were supplied by wells, or a ratio of close to 24 to 1. This is particularly significant in this plant because of the increasingly critical situation in water supply from the wells.

The water table had been dropping noticeably and conservation measures were necessary to cope with the decreasing availability of water from these wells. While the ratio given above represents the yearly average, it is of interest that during August of the same year when maximum cooling water was required, the ratio of cooling tower water to well water supplied to the plant was approximately 41 to 1.

Significantly enough, a few years earlier, and before an additional sewage charge went into effect, the ratio of cooling tower water to well water was only 6.5 to 1, and well water usage was four times the pres-



ent. Water conservation, by use of cooling towers, helped to lower operating costs by decreasing the sewer use charge.

Heat Exchangers—Plant engineers have pointed out that in their experience one of the most uneconomical units in a water system is the undersized heat exchanger. It can easily use from 5 to 10 times the water that a properly sized exchanger would use. This not only increases the operating costs but eventually requires increased investment in pumps and water lines. The greatest occurrence of undersized coolers, according to the engineers, are those supplied as auxiliaries along with purchased equipment.

One of the divisions has established the following specifications in an attempt to eliminate the use of undersized coolers on equipment requiring water cooling:

"Cooling equipment shall be capable of supplying adequate cooling with water inlet temperature of 85F and an outlet temperature of 95F. Cooling water is available at 55 psi and a hardness of 24 grains."

Welding Equipment—Another area in which water conservation has proven beneficial is in the reduction of water usage in welding machines. This has been accomplished in various ways in addition to installation of recirculating systems. For instance, mechanical refrigerating systems have been used instead of water cooling.

Other successful techniques for welding operations have been in the use of thermostatically controlled valves, particularly where mercury arc rectifiers are used, and in the use of water valves which are synchronized with the operation of the welding presses. Each of these control devices obviously makes sure that no water is used while the equipment is not in use and takes control of water flow out of the hands of the operator. Thermostatic control of cooling water to air compressors has also been successful.

Coolant Temperature Control—One additional example of water savings in a cooling application was in a process involving the honing of cylinders which required accurate size control. This meant that the coolant used on the honing machine had to be kept within very close temperature limits. The plant decided that an integral mechanical refrigeration unit should be used on each machine rather than water coils in the coolant reservoirs. The reasons for this choice were: 1. The refrigeration equipment was self-contained and compact; 2. Lower plumbing costs would result; and 3. Water was conserved by using this equipment.

Condensate Returns—In many cases condensate from coils used to heat a processing solution is not returned to the powerhouse as feed-water makeup. This is because of the possibility of contamination of the condensate by the development of leaks in the coils and sub-

Fig. 2. Typical use—more correctly abuse—of rinse water hose at a plating installation, allowing water to waste freely.

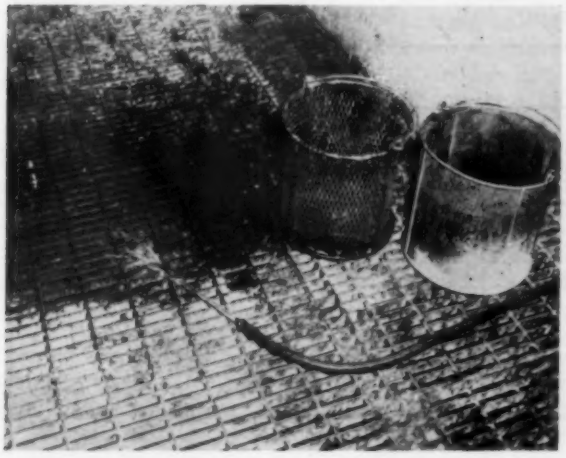
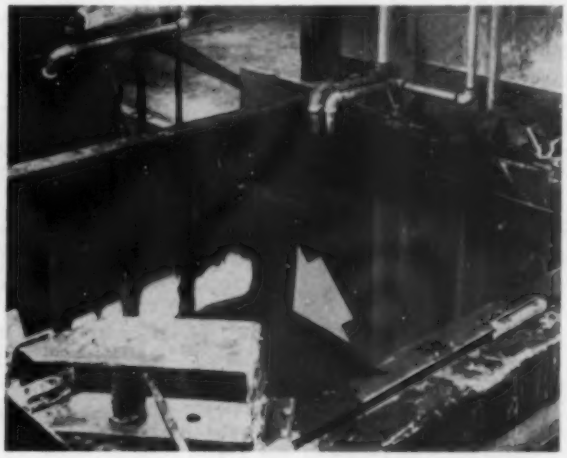


Fig. 3. Application of conductivity measuring equipment installed in the return lines to control the plating rinse water.



sequent loss of the processing solution into the condensate lines. To some extent this is being controlled by the use of conductivity measuring equipment installed in the lines returning from these operations and several plants have done this. See Fig. 3.

This water can be recovered and used as process rinse water and for solution makeup. As rinsing water it has the obvious advantage of being free from minerals and allows the parts being rinsed to dry without spotting.

Used as solution makeup water, with its high purity it avoids introduction of contaminants into processing solutions and helps to extend solution life, thus adding to its value as a water conservation measure.

Impure Condensate—Steam condensate, however, is not always absolutely pure water, as most powerplant operators will testify. Boilers operated at high ratings, even with well maintained separators, have an annoying habit of entraining boiler water, with its high solids content, along with the steam being supplied to the plant. Condensation of the steam, of course, entraps these boiler water droplets and produces a certain amount of contamination.

In addition, if the steam is used to drive equipment such as air compressors, the exhaust steam obtained from these pieces of equipment and normally distributed to the plant for process heating usually contains noticeable amounts of steam cylinder oil. Obviously, condensate contaminated with this oil would be a poor choice for rinsing operations, particularly where the rinsing process is to be followed by some finishing technique such as electroplating or painting.

Counterflow Rinsing—In the plating operation, for instance, considerable effort has recently gone into the use of counterflow rinsing in place of the usual rinse tanks. Control of the quantity of rinse water by use of conductivity meters which allow water to escape only when it becomes contaminated beyond a designated concentration, the use of air to blow off concentrated solutions, the use of finely divided fog or spray rinses, and the use of steam which condenses on the surface of the part have each contributed toward lowering the quantity of water used.

Special control valves have been inserted in an attempt to overcome the disadvantages of manual control of water to rinse tanks, and in at least one case, a considerable reduction in water use was obtained by simply installing a master valve in the water main supplying the rinse tanks and making one individual responsible for opening and closing the valve.

Closed Rinsing Systems—Another approach was used by one plant in making a completely closed system out of its plating operation. The system operates this way: As the plated parts are raised above the plating tanks, they are sprayed with water from the nearby still-rinse tank. They are then dipped into the still-rinse tank and on emerging are sprayed with condensate from the plating tank heating coils. This recovery rinse system has not only reduced the rinse water one-half, but has eliminated the need for a costly rinse water treating plant. It has also reduced cost of chemicals in plating.

Other Areas for Savings—Another processing area which responds to conservation methods is one in which emulsifiable oils for cutting are used. Attention to cleanliness in these systems and removal of bacterial contamination extends solution life considerably, and in doing so eliminates the need for discharge of the solution and subsequent makeup with fresh water. Some of the plants have been using the same soluble oil in a circulating system for a period of years.

An area of water saving which might be overlooked is in the shop washroom. In a large manufacturing plant, a considerable amount of water can be wasted during the washup period if attention is not paid to proper valving of the wash basins.

In one of the plants making use of the circular type of wash basin, conversion was made from the original circular foot-operated ring for control of the water to a standard gate valve because of the high cost of maintenance.

It was soon found, however, that these gate valves were left open after use and so much water was being wasted that welding operations in the plant were affected. The plant engineer remedied the situation by installing toilet flush valves

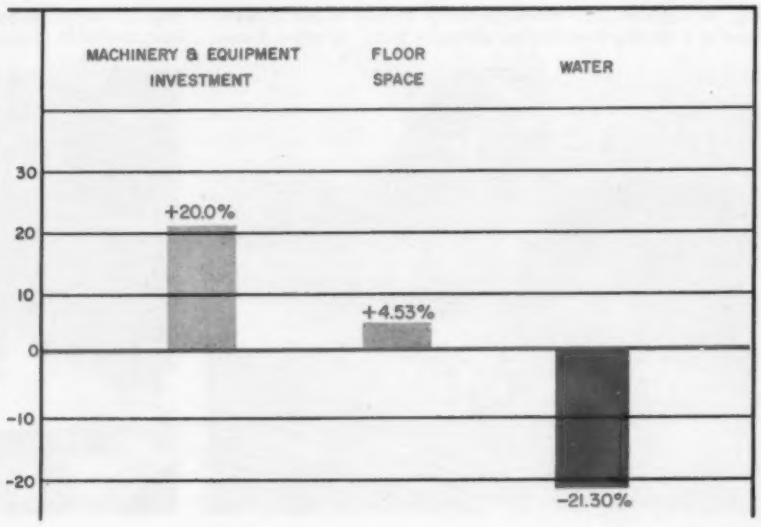


Fig. 4. Comparison between increase in investment in machinery and equipment and in floor space with lowered water consumption over period of one year.

in place of the gate valves. See Fig. 5. The men in the plant are happier because the hot water is not all gone when they are ready to wash.

The valves do a good job as they allow just enough water to wet, wash, and rinse the hands before cutting off, and most important for the plant, welders were kept in operation until additional water conservation and supply systems were installed.

One additional saving in water is in the reuse of effluent from industrial waste treating plants. While the chemical characteristics of this water are usually such that it would be unusable for many operations, certainly it could be used for quenching and primary rinsing and for processes requiring water as a means of transporting solid materials such as in ash handling systems.

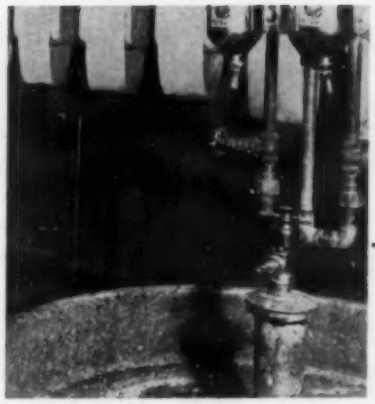


Fig. 5. Installation of flush type toilet valves on these wash basins eliminated excessive use and wastage of water.

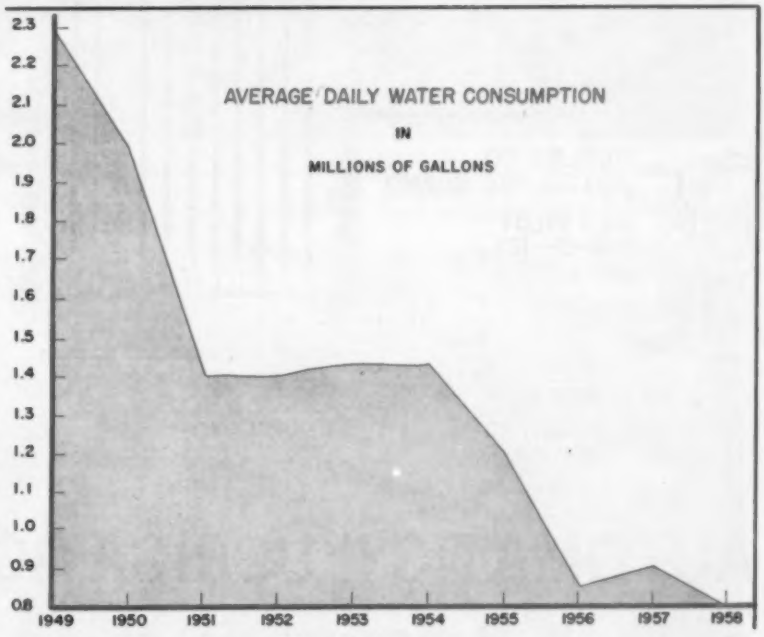


Fig. 6. These are the results obtained from a concerted effort to reduce water usage in a GM manufacturing plant.

Committee—Planned Program

These examples illustrate some of the techniques used to conserve water in cooling water applications, heating operations, and in processing water applications. However, there are other methods of conserving water that are equally important. For example, in one plant a five-man committee was established which developed an effective water conservation plan through:

1. Employee education of the need and methods of saving utilities.
2. Preventive maintenance on all utility handling equipment.
3. Designing utility conservation into new equipment.

This plant started its concentrated drive on utility conservation in October, 1957. In a single year in which the program had been in effect, the use of water in the plant had dropped 21.3 per cent, while machinery and equipment investment had increased 20 per cent, and floor space had increased 4.5 per cent. See Fig. 4.

Another plant centered its conservation program around installation of recirculating water systems, automatic control of water supply to individual machines, and careful techniques for the recovery and return of steam condensate. The program saved the community over 360 million gallons a year.

Average water use per month at this plant has remained the same in spite of the doubling of the plant's floor space, resulting in increased domestic and sanitation usage, increase in water consuming processes and equipment, and a 100 per cent increase in boiler capacity and steam production.

Another division initiated a steam control program tailored to plant operation that produced a water saving. Careful control of steam usage during second and third shift operations and on weekends resulted in a noticeable reduction in the amount of steam demand from the power plant with a consequent saving, not only in water used for makeup, but in the coal consumed by the powerplant.

A problem that was not primarily water conservation, since ample supplies were available, but was one of limited sewer capacity in the municipal system, faced another plant.

A determined and planned approach to water conservation was started with a survey on all water-using equipment to determine the proper flow for the prescribed job and how process waters might be segregated to the proper sewer system. Correct water flow was established from engineering data and from on-the-job observation. Once established, the flow was checked by the daily recording of readings from meters installed on large water-using equipment such as plating systems. The program has been broadened and now incorporates changes in design of equipment as well as simple water reduction procedures.

The number of plating convey-

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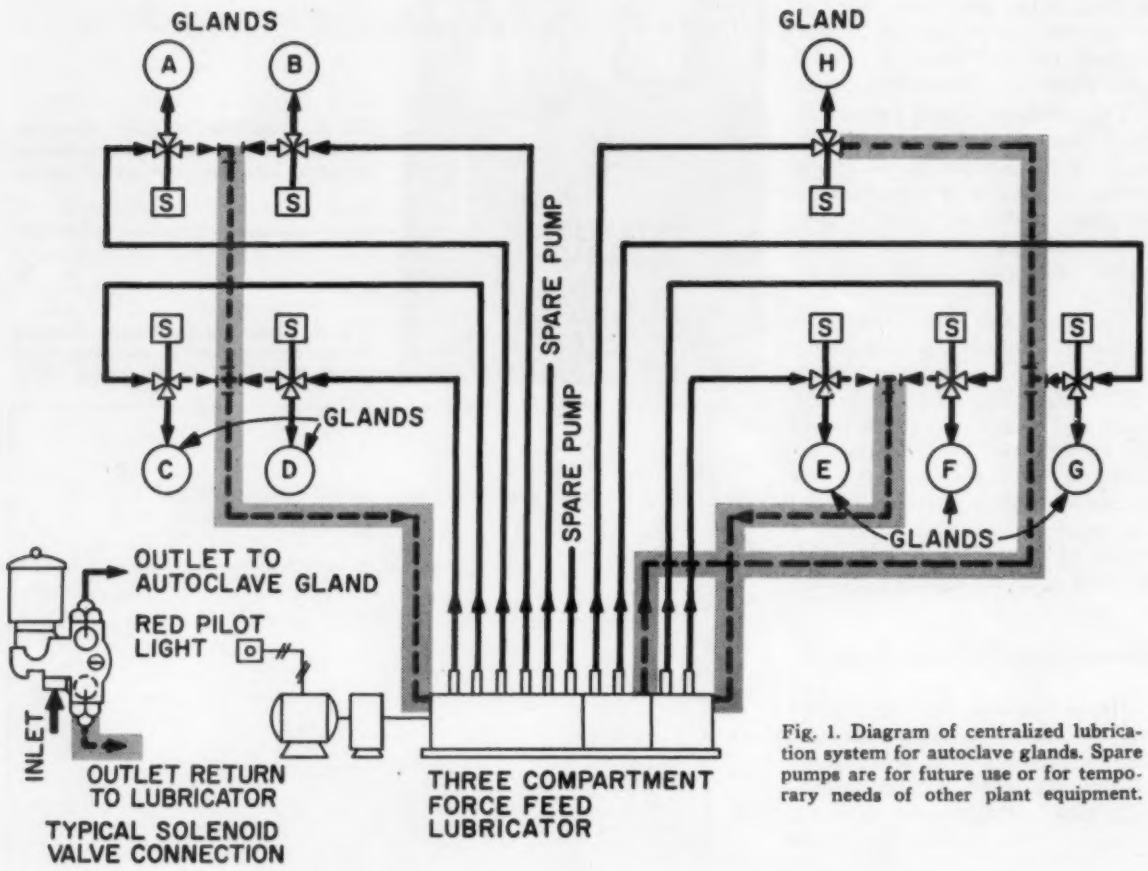


Fig. 1. Diagram of centralized lubrication system for autoclave glands. Spare pumps are for future use or for temporary needs of other plant equipment.

AUTOMATIC LUBRICATION of High Pressure Packing Glands

By W. C. BURNS, Engineer, Shell Development Company, Emeryville, Calif.

THE SUPPLY OF lubricant to shaft packing in the conventional packing gland for top entering stirrer shafts of low pressure autoclaves presents little if any maintenance problem in the modern industrial plant. However, if the internal working pressure of the unit is raised to the range of 50 to 650 psi or higher, then lubrication problems and subsequent troubles are often encountered. Trouble shows up in the form of burned packing, scored shafts, product contamination and expensive downtime for the operating unit.

To discuss a solution of the lubrication problem it is first necessary to assume that the packing has been properly selected and installed, and the stirrer shaft has good lateral and thrust bearing support so as to hold run-out within an acceptable limit (usually about 0.003 in. maximum). In addition, if the unit is operated at high temperature, or if the shaft has a high surface speed, it is assumed that some provision is made to cool the packing continuously.

The packing lubricant (sealing fluid) may be grease, oil, or any number of other media which may be compatible with vessel product and consistent with the requirements for a particular shaft material or packing specification. Injection of the fluid into a lantern ring may be on a periodic or continuous basis. Our experience has shown that oil injected continuously is the most acceptable lubricant for stirrer shafts, hence this method of lubrication will be the only one discussed here.

An acceptable oil lubrication system for high pressure packing glands should satisfy the following basic requirements:

1. Automatically start, and continuously supply, an adequate quantity of a specified lubricant at the proper pressure when the stirrer shaft is started.
2. Automatically stop the flow of lubricant when the stirrer shaft is stopped.
3. Provide a simple and rapid

means of changing quantity and specification of lubricant to an individual gland.

4. Be able to supply a single gland or all glands on the system automatically and instantaneously.

5. Provide a visual or an audible signal for plant operating personnel when system fails.

6. Require a minimum amount of attention from plant operating and maintenance personnel.

Figure 1 shows a schematic of a typical centralized automatic gland lubrication system. The basic components are a lubricator unit, solenoid valves, and pilot light. Figure 2 shows the physical installation of such a system in a plant structure.

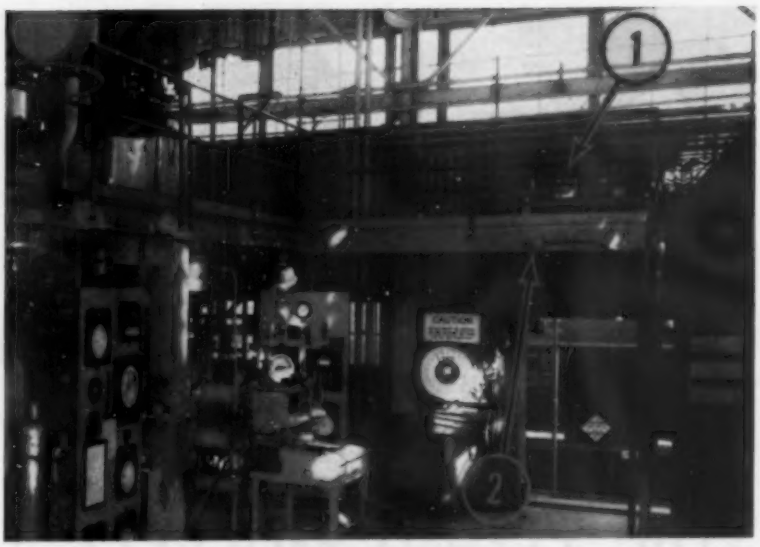


Fig. 2. Above: In-plant view shows location of lubricator assembly 1, and red pilot light 2, with respect to autoclaves.

Fig. 3. Below: Closeup of lubricator assembly shows components including lubricator, speed reducer, drive motor.

Heart and Brains of System

The heart of the system is a multicompartment force-feed lubricator which is driven by a ⅓ hp, 1750 rpm motor. A gear reducer with a reduction ratio of 576 to 1 is installed between the motor and lubricator. Clear plastic top, vacuum sight feed pumps with maximum possible discharge pressures to 10,000 psi are used in the lubricator. These pumps supply an adjusted quantity of oil to the autoclave packing glands through ¼-in. OD tubing which is connected to a solenoid valve located at each gland. The installed lubricator assembly is shown in Fig. 3.

If a lubricator is considered the heart, then a solenoid valve may be called the brains of the system. Each solenoid valve is tied electrically to the starting circuit of an autoclave stirrer drive motor. The valve is a three-way unit which receives oil from the lubricator and routes it either to the gland when the drive motor is operating or back to the lubricator reservoir when the motor is off. See Fig. 4.

The valve has two additional features. One is a manually-operated device which permits valve operation when the solenoid is out of service. The second is a spring-loaded, pressure-relief device which allows oil to return to the reservoir in case of overpressure at the gland outlet. Overpressure conditions may occur if the valve outlet becomes plugged with foreign matter or if a ring of packing is forced over the lantern ring port in the stuffing box.

A red pilot light provides the necessary visual signal to let plant operating personnel know that the lubricator unit is in operation. This light is connected to the lubricator drive motor circuit and it is located so as to be visible from any operating area within the building.

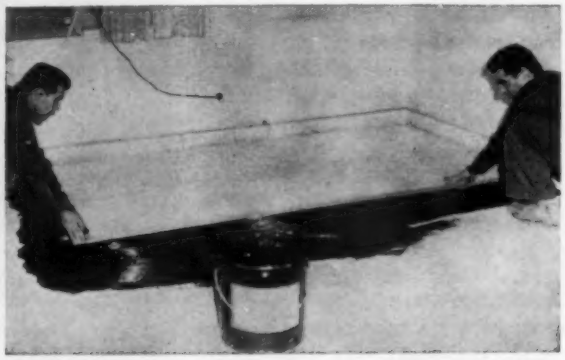
System maintenance consists of a daily filling of the lubricator reservoir compartments with the required specification oils.

A centralized automatic lubrication system, if applied properly, is able to satisfy the basic lubrication needs of high pressure packing glands, and will allow the maintenance group to shift its effort to other responsibilities. **End**

Fig. 4. Solenoid valve (center) is installed on this 300-gallon glass-lined autoclave.

Two men spread asphalt tile cement onto old floor, starting from one corner and working into the room. The cement is placed over only one half of the room at one time.

Three by five foot fiber glass panels are placed on cement. These panels are then coated with cement and the four by eight plywood sections placed on top, overlapping panels.



THIS FLOOR MUFFLES VIBRATION

Fiber glass panels sandwiched between original floor and plywood reduce vibration

WHEN AN increase in telephone facilities necessitated plant expansion, Pall Corporation, Glen Cove, N.Y., had to find, or make, a vibration-free room. The only available space was a room, 18 by 20, directly above a 24-in. wide, steel rolling mill and a 10-ft, ¼-in. shearing machine.

It was decided to use a technique employed successfully by one of its subsidiaries, Fibrous Glass Products, Inc., of Hicksville, N.Y.

Some of their resin-bonded fiber glass was used in a vibration damping installation. The job consisted of installing 10,000 sq ft of fiber glass boards, four inches thick, under the concrete slab of a building housing delicate instruments and in which critical laboratory experiments were to be performed.

With this background experience, it became a simple matter to provide a floor which would be capable both of supporting the heavy telephone switching equipment and of damping outside vibrations.

The original floor consisted of a single layer of ¼-in. plywood laid over a basic subflooring. This was sufficient when the room was used for storage. The subflooring was directly over the beams. Some of the plywood veneer had begun to warp, but this was not considered a problem. Nor was the accumulated dirt significant, except that the loose pieces had to be swept out.

Plans called for completion of half of the floor at one time, moving of existing telephone switching equipment to the newly laid portion, then completion of the second half of the floor. Afterwards, additional telephone equipment was to be brought in.

Initial preparation consisted merely of sweeping the floor. Using ordinary asphalt tile cement, right out of the drum, two men started from one corner to lay a thin coating over the existing floor. As they finished a large enough portion, they laid several sections of the fiber glass board in place. Each panel measured three feet by five feet and one inch thick.

The first half of the floor was covered with the fiber glass panels. Once completed, the two men moved back to their starting point and covered the panels with the cement, troweling it on as before. As soon as they had spread a section large enough for a four by eight plywood section, they laid the plywood, ¾-in. thick, on the covered area. Both the panels and the plywood were placed at a distance of one inch from the walls. This was to minimize transmission of vibration through the walls.

After all the plywood for the first half of the room was in place, it remained only to lay linoleum on the plywood. The linoleum came in a nine-foot roll and was cut to fit. It too was placed an inch from each vertical wall.

Total time for installing the floor was about an hour. **End**

Panels are set one inch from the walls to minimize any vibration transmission.

BUILT FOR THE DIZZY WHIRL

CAN CENTRIFUGAL SEPARATORS SOLVE YOUR PLANT PROBLEMS?

Recovery of precious materials, protection of equipment through removal of contaminants from lube oil, clarification of coolants used in grinding, are just a few jobs for centrifuges

By EDWARD G. BAHRET, The De Laval Separator Co., Poughkeepsie, N. Y.

CENTRIFUGAL FORCE, a by-product of inertia, has many glamorous space-age applications. It holds satellites aloft, enables gyros to guide missiles, and even simulates gravity to test an astronaut's endurance on a whirling boom. However, for years the down-to-earth applications of the same force in centrifugal separators has been, without fanfare, raising productivity and profits in many industries.

Centrifugal separators have harnessed this inertial force to perform the following typical plant operations:

Purification of Bunker C or other cheap residual oils for diesel engine and gas turbine operation

Clarification of coolants used in fine quality grinding and honing

Recovery of valuable solids from coolants

Protection of turbines and diesel engines by removal of water and sediment from lubricating oils without loss of necessary additives or inhibitors

Purification of transformer insulating oil

Purification of hydraulic fluids for actuating systems to prevent scoring or sticking

Extraction of cutting oils from metal turnings

Most of the separation processes handled so efficiently by centrifuges could be accomplished by natural gravitational settling, but the storage time required by the natural process is just too long to be feasible. Also, as an extreme case, in an emulsion where a heavy liquid is dispersed in fine drops through a light liquid, gravity is too weak to separate them at all. Centrifugal separators provide faster action than natural separation by producing artificial forces thousands of times stronger than gravity.

Types Available—Applications

There are as many separation problems as there are types of mixtures to be separated. Each separation problem has its own peculiarities and there are numerous variations within each type. Since it is difficult to predict exactly which machine will be most effective in any given service, this article will describe the general machine types and relate them to their most probable applications. Sizes, adjustments, attachments and other features can change the suitability of a machine to a process, but they should be checked with the manufacturer.

Speaking in general terms then, the types of equipment to be considered are the hollow-bowl, disc-bowl and disc-bowl with solids discharge, basket centrifuge, multiple clarifier, cylinder bowl clarifier, hermetic centrifuge and conveyor-bowl separator.

Disc-Bowl Unit: Best suited for purification of residual oils for diesels and lubricating oils.

Basket Centrifuge: For purification of cutting oils and coolants and for recovery of precious metals and diamond chips.

Hermetic Type: For purification of volatile fluids.

Conveyor-Bowl Centrifuge: For removal of high concentration of solids from a slurry or when in suspension.

Modern centrifugal separators are actually sophisticated big brothers of the dairy farm cream separators many people will remember from their childhood. The most common types are the hollow-bowl and the disc-bowl. Both have a bowl or container which is driven at high rotational speed. Liquid, introduced into the center of the whirling bowl, is forced by friction to rotate with the bowl. Due to inertia the liquid particles try to follow a straight-line path, but since they are trapped in the bowl they cannot. The only course left is to push outward to the bowl wall as they rotate, much as a ball whirled on the end of a string strains to fly away from the holder.

(Please turn page)

CENTRIFUGAL SEPARATORS CAN SOLVE PROBLEMS

The heavier the liquid or suspended solid is, the greater will be the force acting on it. Since two particles cannot occupy the same space at the same time, the heavier particles will crowd their way to the bowl wall and collect there while the lighter particles are trapped nearer the center.

At a typical operating speed of 6000 rpm, the centrifugal force developed is greater than 9000 gravities. Consequently, only a small weight difference between particles produces a very large differential of acting force and separation efficiency is high.

Hollow-Bowl Separator

The hollow-bowl separator can use this action to separate two liquids and suspended solid material. Under the influence of centrifugal force, material fed into the center of this rotating bowl is separated into its heavy phase (heavy liquid), light phase (light liquid) and solids. Solids are flung to the bowl wall and collect there. The heavy liquid gathers near the solids on the bowl and the light phase is constrained to stay near the bowl axis.

Continuous incoming flow of material forces the heavy liquid out a discharge spout near the bowl rim and forces the light liquid out a spout near the axis. Solids separated by this equipment are retained in the bowl and build up on the wall as flow continues. This build-up gradually reduces separation efficiency and eventually blocks the discharge passage altogether, requiring shutdown for cleaning.

Disc-Bowl Separator

The disc-bowl separator, a newer type, stores accumulated solids out of the zone of separation. This equipment therefore operates at constant efficiency throughout a run.

Disc-bowl separators have a series of conical-shaped discs mounted within the bowl. They divide the bowl space into thin strata, usually not more than 50/1000 of in inch thick. Feed material is injected between the discs from the bottom of the bowl flowing through holes in the discs into all the inter-disc layers. More than 80 per cent of the separation occurs immediately after the material is distributed through the discs; the heavy material flowing to the wall for discharge and the light material being displaced toward the bowl axis for discharge.

When this type of separator is built with disc holes near the outer rim, the light liquid is purified to a greater degree since it has further to travel under the influence of centrifugal force. Likewise, the heavy material benefits when the holes are located near the inner edge of the disc.

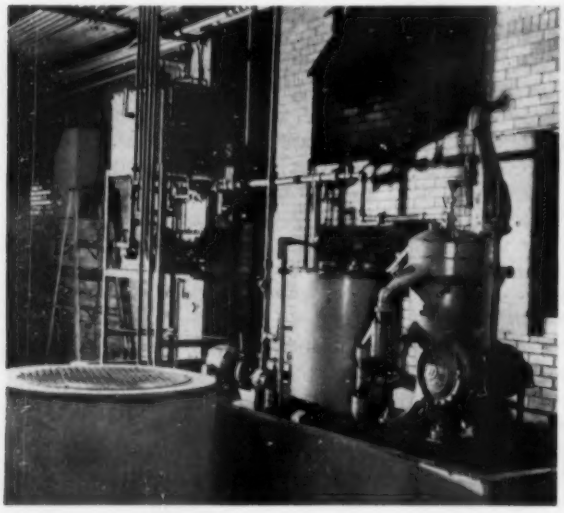
Many plants are successfully using disc-bowl separators to upgrade cheap Bunker C, No. 6 or even used crankcase oil for diesel fueling. Ability to use these fuels provides significant savings since they are only one-third to one-half the cost of standard distillates, often less than oil companies pay for crude at the well.

To burn these oils efficiently, suspended solids and free water containing dissolved salts must be removed. Specifications on the contents of these oils are quite broad and each installation must be treated individually. No. 6 oil may have 2 per cent solids and water by volume, including any combination of solids and water up to the point where the entire 2 per cent impurities is solid material.

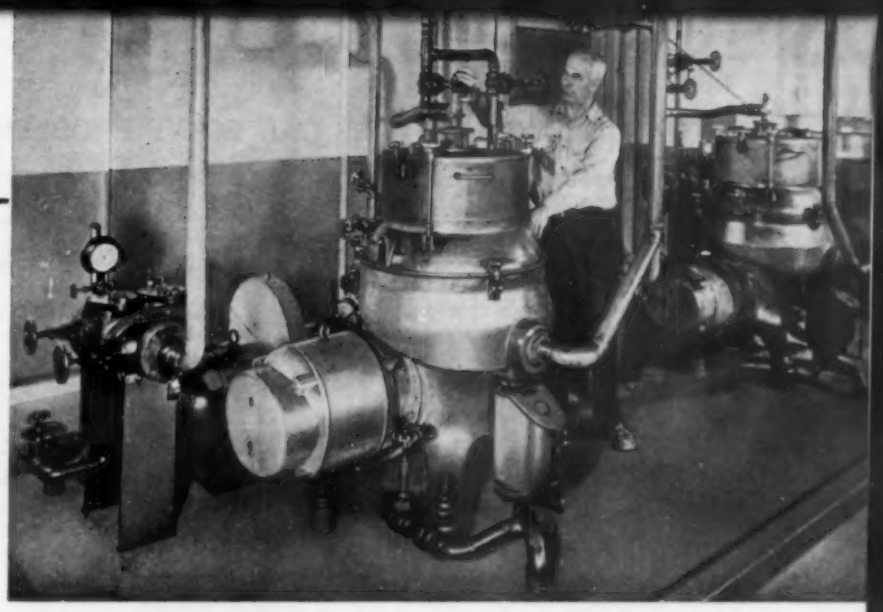
In the latter case the separator will have to extract 2 gal of solids for every 100 gal of oil purified, a rugged problem indeed. Since impurities composition can vary, it is always recommended that the separator should be of high quality and if possible of larger capacity than normally needed.

In the first few moments of disc-bowl operation any dirt present in the oil is thrown to the bowl wall and the oil and water separate from each other in concentric rings, with the water near the wall.

Turbine-lube oil purifiers such as this one installed at the Mitersky Power Plant in Detroit, help protect wearing parts.



Coolant clarifier at left removes ground glass from coolant, minimizes wear on diamond wheels, eliminates downtime.



Purification of residual oils or Bunker C is another function of centrifuges.

If, after the bowl is first filled, the flow of dirty oil is stopped, the oil and water will stay separated in this balanced condition for as long as the bowl is kept rotating. From that point on, for every drop of oil admitted through the inlet tube, a drop of purified oil will flow from the discharge; similarly for every drop of water entering with the oil, a drop of water will be discharged. The balanced condition is maintained even if the proportion of water to oil fluctuates rapidly.

Bowls actually sludge out a considerable amount of the lighter solids with the water, but when the heavier solids build up thickly on the wall, the bowls can be cleaned by flushing or simple manual cleaning.

Purifying Crankcase Oil

For residual fuels with particularly high solids content, e.g. used crankcase oil may have as much as 10 per cent solids by volume, there are two special types of disc-bowl separators available.

The disc-bowl centrifuge with continuous solids discharge has a bowl with a V-shaped bulge around the middle. As the solids are thrown to the wall they travel to the area of largest diameter and collect in the apex.

Then, through specially designed nozzles in the bowl wall, they are discharged continuously while the bowl keeps running at full speed. Of course some of the heavy liquid is discharged along with the solid material but this has no effect on operation. The nozzles are specified in different sizes to allow a predetermined amount of solid matter to discharge.

A variation of the continuous solids discharge separator is the self-cleaning disc-bowl centrifuge. Solids accumulate along the bowl wall until a predetermined level is reached. The entire circumference of the bowl wall is then opened by hydraulically lowering the bowl bottom. Solids discharge by centrifugal action, while the bowl continues to run at full speed. When the solids are discharged, the bowl closes again and the purification operation is resumed.

The basket centrifuge is similar to the hollow-bowl separator but does not have separate discharges for light and heavy liquids. Coolant or cutting oil to be clarified is fed into the center of the whirling bowl and subjected to centrifugal force. Solids present in the liquid are packed tightly against the wall while the clarified liquid is simply displaced upward over the bowl lip for recovery.

Designed for individual use on grinding, honing or turning units, this equipment requires little floor space and is easily installed. A typical unit has a throughput of 15 gpm and dirt-holding capacity of three gallons before shutdown for cleaning. It can remove non-ferrous metal particles and abrasive grains missed by magnetic equipment, as well as the minute harmful particles of sediment that can pass through filter material. With this equipment there are no filters to replace and the cleaned coolants speed up grinding operations, assuring uniform, scratch-free surfaces.

Solids spun out of the liquid are compacted so tightly that they are removed as a clean, relatively dry mass. This makes the basket centrifuge particularly applicable for recovery of grindings from precious metals, diamonds and similar valuable materials.

Clean, dry oil is vital in many operations. Centrifugal separators offer the best opporunity to achieve this on a continuous basis.

In processing transformer insulating oils, for example, purification can be carried out at temperatures of 90 F to 110 F. Low temperature purification greatly minimizes the possibility of water dissolving in the oil to later precipitate as free water, finely dispersed in the oil. Some centrifuges can reduce the free water content of transformer oil from an initial 1/10 of one per cent to 1/1000 of one per cent, raising the dielectric strength of the oil to 30 kv.

Similarly, turbine lubricating oils and hydraulic actuating system fluids can be purified for reliable operation. The oil can be cleaned and dried in a single pass without danger of additive loss.

For a general idea of centrifuge capabilities, the maximum purifying capacity of one large centrifuge, De Laval disc-bowl direct drive purifier Model 94, is as follows: 1000 gph of light lube oil at 120F; or 1000 gph of geared turbine lube oil at 150F; or 1800 gph of insulating oil.

Special Types

Other centrifuge types, more difficult to relate to generalized plant applications, are also available. Though designed for specific uses they should be considered carefully since with proper attachments and adjustments they might handle your particlar application.

The multiple clarifier has some

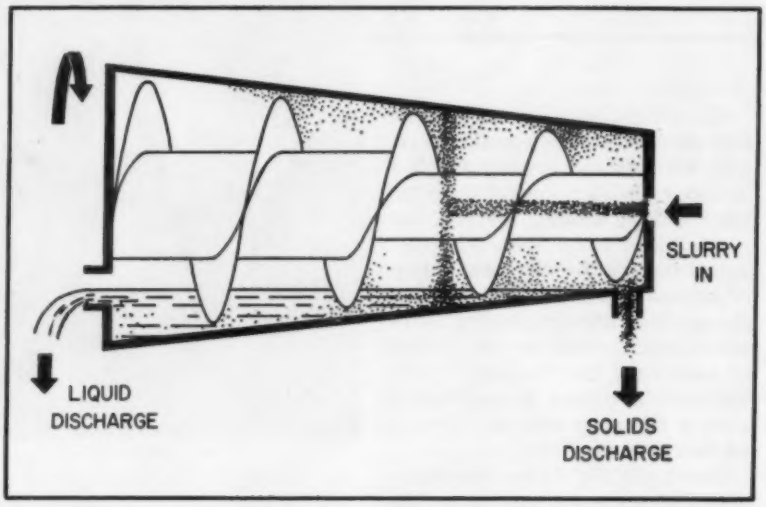
CENTRIFUGAL SEPARATORS CAN SOLVE PROBLEMS

resemblance to the basket centrifuge except that it is made with a double bowl.

Feed material enters through a hollow inlet tube at the top of the machine and passes into the inner chamber where heavy particles are immediately centrifuged out to the wall. The partially purified liquid then passes through the base of the inner chamber into the outer bowl where the larger bowl diameter generates much greater centrifugal force. Here the smaller particles are deposited without interference of the larger particles.

Fully clarified material, displaced by incoming material, rises along the outer chamber wall and is discharged. This type can be obtained with multi-speed motors to alter the bowl speed, a feature of particular advantage when there is a need for selectivity. Some material can be left in the feed liquid while unwanted material is eliminated.

This equipment is considered ideal for the removal of particles from varnish, enamels, lacquer and shellac; the removal of burned crumbs from cooking fat; and the clarification of printing inks, patent medicines, waxes and many other liquid processes.



Conveyor bowl centrifuges can remove and concentrate solids from slurries and suspensions. Helical scraper then moves the solids to a discharge outlet.

Another form of clarifier, the cylinder bowl, has four inner chambers instead of two. Feed material enters the innermost chamber where the largest impurities are centrifuged out. It moves progressively through succeeding chambers, subjected to more and more centrifugal force and greater clarification until it leaves the last chamber. Each chamber removes and stores more and more of the material. The solids are held in the sediment pockets of each chamber until manual cleaning when they are removed in dry cake form. This is a special asset when recovery of valuable solids is desired.

Cylinder bowl clarifiers are used for maximum clarification of coffee extract, wort in the brewing industry, wines and other liquids. They have recently been applied with notable success in the manufacture of pharmaceuticals.

One model of this type, with a basket bowl and three inner chambers, can increase wort yield as much as 4 per cent per brew. It separates impurities in dry cake form while the clarified wort is discharged ready for the fermentation process. It can clarify 85-100 barrels of hot wort per hour and will hold the impurities from 600 barrels before cleaning. This equipment can be operated at any set throughput and the clarity can be adjusted to the degree desired.

The hermetic centrifuge is an example of special features added to existing types of equipment to meet special needs. It is basically a constant efficiency disc-bowl separator equipped with long life seals at inlet and outlet. The seals permit operation under positive pressure and allow separation or purification of liquids which are flammable, viscous or which for any other reason must

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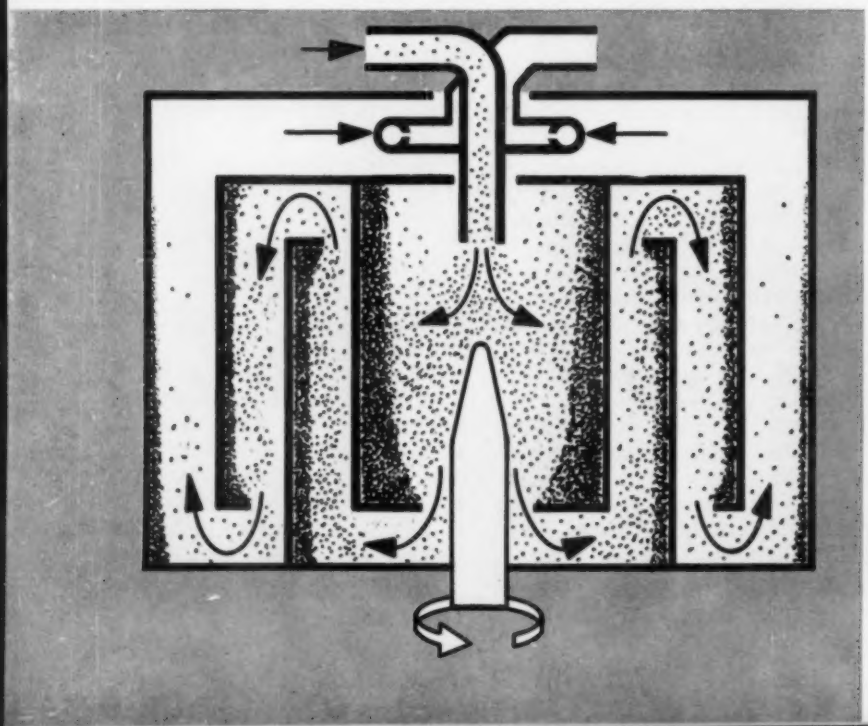
In a multiple clarifier material enters through a hollow inlet at top of the machine and passes into inner chamber where heavy particles are centrifuged to the wall.



DO YOUR PLANT UTILITY COSTS GET A FAIR SHAKE?

Here's what we did to lower them in our plant

By G. C. SILENGO, Plant Engineer
Bendix Aviation Corp., Hamilton, Ohio

IT IS NOT UNUSUAL for a plant to be put into full operation without giving utilities the same consideration as the production facilities.

When Bendix Aviation Corporation acquired a plant in Hamilton, Ohio, the previous owner had been making products entirely different from the aircraft accessories Bendix was to produce, and it was obvious that many changes would have to be made in plant layout and plant facilities.

Three years ago we made a survey of the utilities required to operate our plant. In doing so, we found that little attention had been given to designing conservation of utilities into equipment and that production personnel were careless in the proper use of the services provided. We started immediately to accumulate data that would tell us what the unit costs of utilities were so we would be able to evaluate the progress of a cost reduction program.

The first step in the program was to establish a series of plant orders (see Fig. 2) to which all maintenance time and material for a specific service would be charged.

At the end of each month the accounting department submits to Plant Engineering accumulated charges for labor, material, miscellaneous charges and fixed charges. These costs are entered on the Utility Cost Sheet (see Fig. 2) along with the consumption and the cost of auxiliaries to produce the service. From this, the unit cost is determined

After a system of accumulating expenses was established, we recorded the consumption of the utilities. Meters were installed on air compressors, the industrial waste system, well water and other utilities, as required. In many cases alterations were made on equipment, whereby waste would be controlled if not eliminated entirely. Additions included solenoid valves and control valves on cooling water lines, contamination controls in rinse tanks, timing devices, and spring loaded valves and many other changes which would contribute to conservation of utilities.

Some utilities such as gas, city water and industrial waste treatment are purchased, and unit costs of purchased utilities are therefore established. The only control we have is proper distribution and use of these services.

Many improvements have been made on equipment in this regard, but the area that required the most attention was the training of personnel in understanding the cost of utilities as related to their departments by presenting specific examples of wasted air, water, steam or other services.

Each man was given a brochure pointing out the cost of utilities when not turned off overnight or during weekends if not needed.

A Utility Conservation Committee

Fig. 1. Power plant consists of three 750-kw generators. Excess power is sold.

PLANT UTILITY COSTS GETTING A FAIR SHAKE?

was established comprising five men with maintenance and utility experience. The committee's objective is three fold; first, to make immediate savings by shutting off and curtailing utilities when not in use; second, to do a better job of maintenance on all utility handling equipment; and third, to do a better job of designing conservation of utilities into new equipment.

The two main areas where we could do most in the way of conservation were water and power.

Consumption of water has steadily increased in recent years and the requirement for treated water in some of the manufacturing processes has also increased because of the effect minerals in untreated water had on some materials.

Well water is pumped to the plant by two, 1000-gpm, deep well pumps at a cost of approximately 20 cents per 1000 cu ft. Normally one pump will carry the load, but there have been periods during mid-summer when heavy air conditioning loads required both pumps to operate for a short period of time. To alleviate this condition, river pumps rated at 1000 gpm and 750 gpm have been piped into the system for standby. All cooling water and some rinsing water is untreated well water.

Water supplied by the municipal plant is used for domestic purposes, boiler makeup, rinse water and fire sprinkler system. The water received at the plant is 3 to 5 gr hardness, and costs approximately $2.50 per 1000 cu ft.

Added to the cost of water is an additional charge for domestic and industrial waste. The charge for treating waste, which is metered by the city, is approximately 85 cents per 1000 cu ft and is billed monthly on a sliding scale basis.

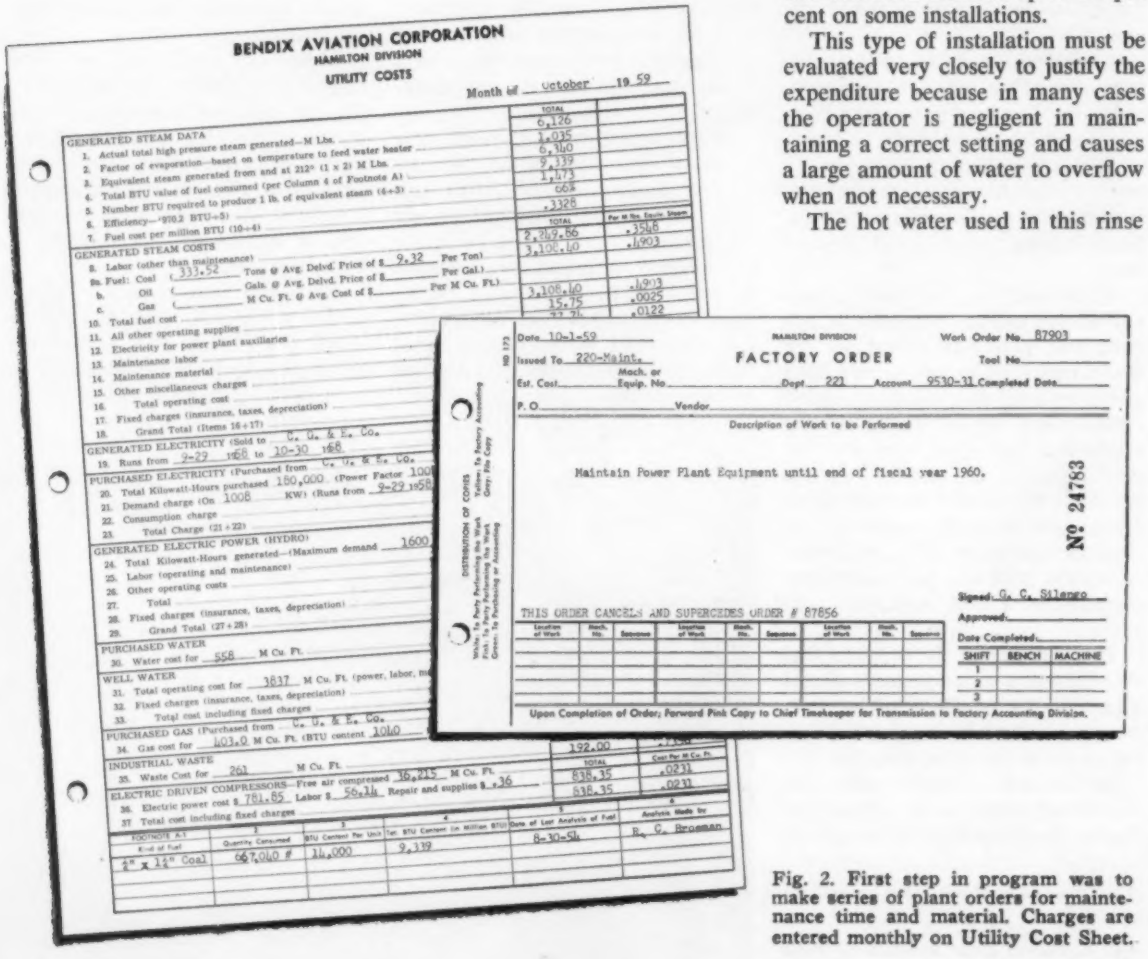
Rinse waters were the first item studied in the conservation program since an immediate savings could be realized from the control of water if the amount of waste could be reduced.

Use of cascading rinse tanks was an immediate approach to reducing the amount of water consumed. With counterflow, water is added to the last tank in a series of rinse tanks and allowed to cascade into the preceding tanks. The previous installations of individual tanks required approximately 25 gpm. Cascading has reduced this amount by about 80 per cent.

Measurement of conductivity of rinse water is also employed in water conservation. Conductivity measuring equipment installed in the rinse tank is set in such a way that it will allow fresh water to be introduced to the system only when the water reaches a pre-determined level of conductivity. Thus, water consumption has been reduced up to 80 per cent on some installations.

This type of installation must be evaluated very closely to justify the expenditure because in many cases the operator is negligent in maintaining a correct setting and causes a large amount of water to overflow when not necessary.

The hot water used in this rinse



BENDIX AVIATION CORPORATION
HAMILTON DIVISION
UTILITY COSTS

Month of October 19 59

GENERATED STEAM DATA

		TOTAL
1.	Actual total high pressure steam generated—M Lbs.	6,126
2.	Factor of evaporation—based on temperature to feed water heater	1.035
3.	Equivalent steam generated from and at 212° (1 x 2) M Lbs.	6,340
4.	Total BTU value of fuel consumed (per Column 4 of Footnote A)	9,339
5.	Number BTU required to produce 1 lb. of equivalent steam (4÷3)	1,473
6.	Efficiency—970.2 BTU÷5)	66%
7.	Fuel cost per million BTU (10÷4)	.3328

GENERATED STEAM COSTS

		TOTAL	Per M Lbs. Equiv. Steam
8.	Labor (other than maintenance)	2,267.86	.3578
9a.	Fuel: Coal (333.52 Tons @ Avg. Delvd. Price of $ 9.32 Per Ton)	3,108.40	.1903
b.	Oil (Gals. @ Avg. Delvd. Price of $ Per Gal.)		
c.	Gas (M Cu. Ft. @ Avg. Cost of $ Per M Cu. Ft.)		
10.	Total fuel cost	3,108.40	.1913
11.	All other operating supplies	15.75	.0025
12.	Electricity for power plant auxiliaries	77.71	.0122
13.	Maintenance labor		
14.	Maintenance material		
15.	Other miscellaneous charges		
16.	Total operating cost		
17.	Fixed charges (insurance, taxes, depreciation)		
18.	Grand Total (Items 16+17)		

GENERATED ELECTRICITY (Sold to U. S. E. Co.
19. Runs from 9-29 1958 to 10-30 1958

PURCHASED ELECTRICITY (Purchased from U. S. E. Co. 100
20. Total Kilowatt-Hours purchased 180,000 (Power Factor
21. Demand charge (On 1008 KW) (Runs from 9-29 1958
22. Consumption charge
23. Total Charge (21+22)

GENERATED ELECTRIC POWER (HYDRO)
24. Total Kilowatt-Hours generated—(Maximum demand 1600
25. Labor (operating and maintenance)
26. Other operating costs
27. Total
28. Fixed charges (insurance, taxes, depreciation)
29. Grand Total (27+28)

PURCHASED WATER
30. Water cost for 556 M Cu. Ft.

WELL WATER
31. Total operating cost for 3837 M Cu. Ft. (power, labor,
32. Fixed charges (insurance, taxes, depreciation)
33. Total cost including fixed charges

PURCHASED GAS (Purchased from U. S. E. Co.
34. Gas cost for 403.0 M Cu. Ft. (BTU content 1040

INDUSTRIAL WASTE
35. Waste Cost for 261 M Cu. Ft. 192.00

ELECTRIC DRIVEN COMPRESSORS—Free air compressed 16,215 M Cu. Ft. TOTAL Cost Per M Cu. Ft.
36. Electric power cost $ 781.65 Labor $ 56.36 Repair and supplies $ 36 838.35 .0231
37. Total cost including fixed charges 838.35 .0231

FOOTNOTE A-1	2	3	4	5	6
Kind of Fuel	Quantity Consumed	BTU Content Per Unit	Tot. BTU Content (in Million BTU)	Date of Last Analysis of Fuel	Analysis Made by
4" x 1½" Coal	667,040 #	14,000	9,339	8-30-58	R. C. Brosman

DISTRIBUTION OF COPIES
White—To Party Performing the Work
Pink—To Timekeeper
Green—To Purchasing or Accounting
Yellow—To Factory Accounting Copy Has Copy

Date 10-1-59 HAMILTON DIVISION Work Order No. 87903
Issued To 220-Maint. FACTORY ORDER Tool No.
Est. Cost Mach. or Equip. No. Dept 221 Account 9530-31 Completed Date
P. O. Vendor

Description of Work to be Performed

Maintain Power Plant Equipment until end of fiscal year 1960.

№ 24763

THIS ORDER CANCELS AND SUPERCEDES ORDER # 87856

Signed G. C. Silenzo
Approved
Date Completed

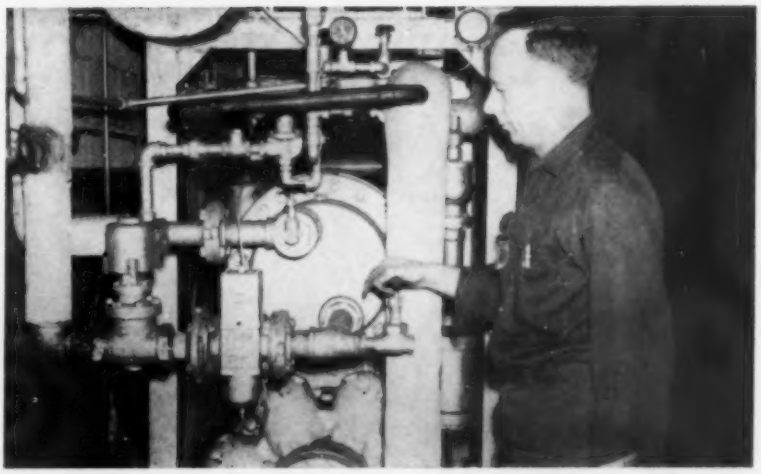
Location of Work	Mach. No.	Sequence	Location of Work	Mach. No.	Sequence	Location of Work	Mach. No.	Sequence

SHIFT	BENCH	MACHINE
1		
2		
3		

Upon Completion of Order, Forward Pink Copy to Chief Timekeeper for Transmission to Factory Accounting Division.

Fig. 2. First step in program was to make series of plant orders for maintenance time and material. Charges are entered monthly on Utility Cost Sheet.

Fig. 3. Bellows valve for sensing head pressure is used on air conditioning units, reducing water flow by 75 per cent.



tank installation is produced by injecting steam into city water. This method is practical for domestic purposes, but, since city water must be used, it is quite expensive for manufacturing processes.

Therefore all hand valves on spray rinse tanks were replaced with spring loaded valves or solenoid valves with timing devices. The amount of hot water wasted prior to the solenoid valve and timer installation is not known, but we do know that hand valves used to remain open on weekends: in fact, it was a weekend survey that brought this to our attention.

Cooling processes include those necessary for air compressors, furnaces, air conditioning, heat exchangers and for control of temperature of processes such as in plating departments.

Air conditioning units previously had 2-in. solenoid valves that would open fully when the unit started. A bellows type valve (see Fig. 3) for sensing head pressure, was installed on all units. It is estimated that the water flow was reduced by about 75 per cent. A 2-in. water line, under 80 psi, running 24 hours per day would cost approximately $23.00 per day for cooling a 75-ton unit.

Special test equipment is required for product testing and development work. Water requirements vary according to the amount of heat to be dissipated or the temperature to be maintained. Three-way mixing valves are normally used with a temperature control unit. A normally closed solenoid valve is installed in the supply line of the heat exchanger so that water will flow only when the equipment is running.

Other Sources of Waste

Cooling tower installations to recirculate water for air conditioning units and air compressors have been studied and are presently being evaluated. In both cases they appear to be favorable since they will be amortized in 20 months.

There are many other places where water is wasted, such as in faulty wash basins, toilet facilities, drinking fountains, etc. These items should not be overlooked since the waste can run from a few drops to thousands of gallons per day.

The other area where significant savings can be made, is in power. Our power plant consists of three Allis Chalmers 750-kw generators which produce electric power for the plant operation. Excess power is sold. See Fig. 1.

Power is generated at our hydro plant at an average of $0.004 per kwh, which is approximately one-half the cost of purchased power. Every effort is made to keep the plant load down, particularly during low water months. From June to September we experience a downward trend in power generation because of low water, which means if the plant load requires more power than we can generate, power must be purchased.

A close watch is maintained on plant load versus purchased power so that a new demand rate will not be established. A higher demand than that previously required, means that for the ensuing eleven months, a new rate no less than 70 per cent of the last demand will be charged.

To avoid this higher rate, several ideas have been put to use in the plant. For example, timers with astronomic dials have been installed on the lighting system around the premises and also on some outside building lights. Lighting inside the plant is controlled through an educational program. Foremen have been told of the cost of power so they make every effort to shut off equipment when not required.

Maintenance supervision tells the department foremen what electrical equipment should be turned off.

Poor power factor contributes to unnecessary costs since utilities impose a penalty for a power factor below 85 per cent. Efforts are made to maintain a power factor of 100 per cent by providing capacitors for large induction motors and installing high power factor synchronous motors for base loads such as air compressors and pumps.

Cost of Oversize Motors

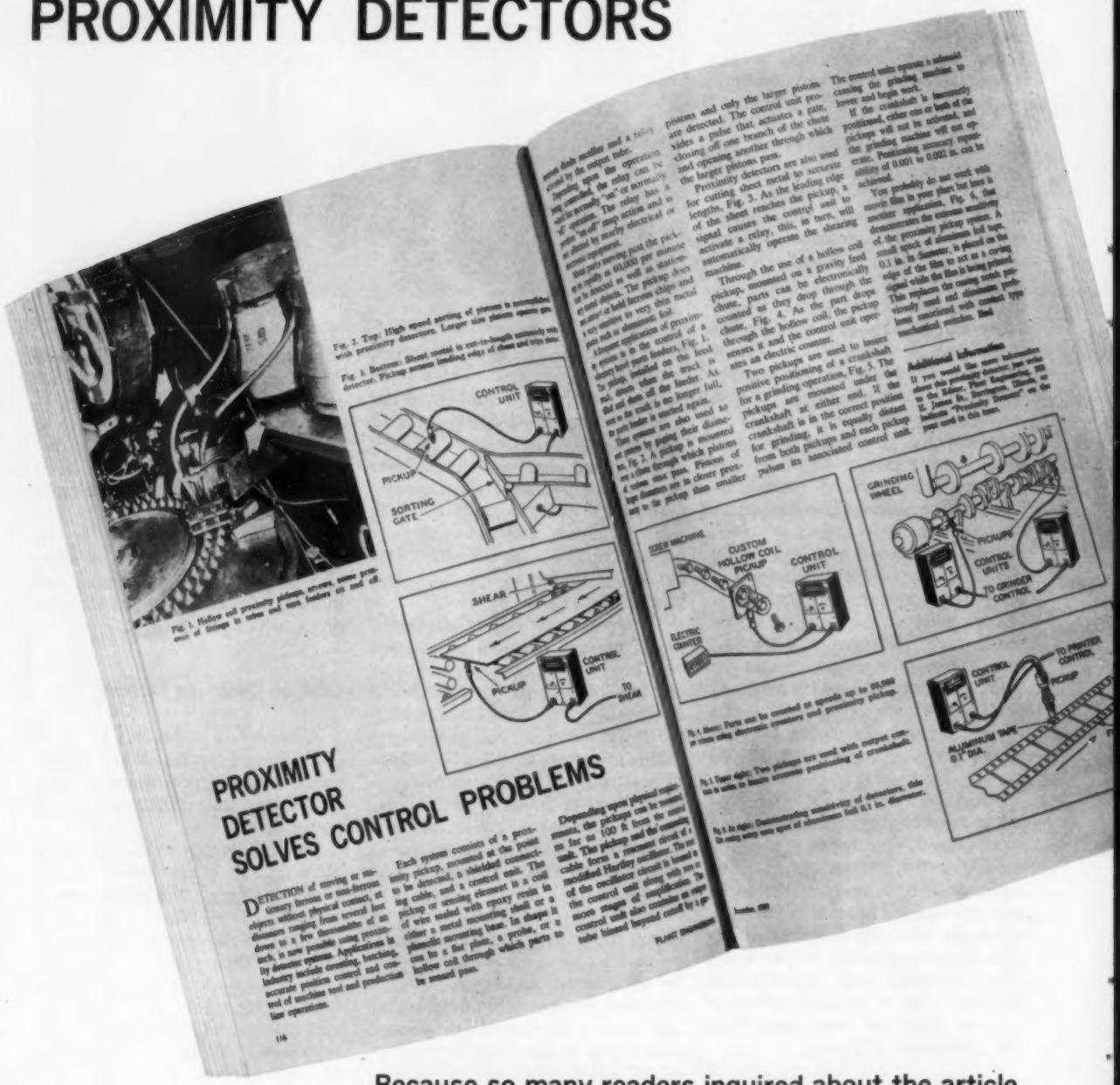
A survey is in process to install capacitors on sections of bus supplying several induction motors or other equipment that might affect the power factor.

The means by which the hydro plant power is connected to the Cincinnati Gas and Electric loop is such that if the power factor drops they are able to help make a correction from their plant.

Over-sized motors also contribute to excessive power cost. Cool running motors and reserve capacity are reassuring, but they are expensive—in original cost, in power factor penalties and in wasted power. A 100-hp motor driving a 50-hp load runs at 72 per cent power factor instead of 85 per cent, uses 2 to 3 per cent more power and may cost $1000 to $1500 more than a 50-hp motor.

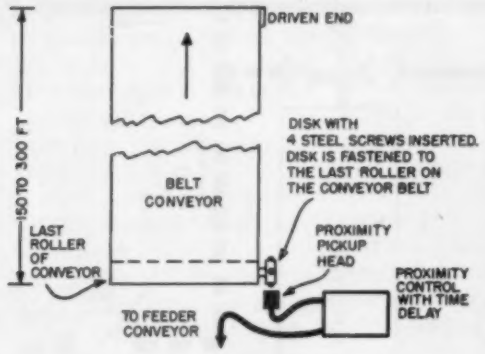
The ideas above are just a good start in trimming power costs in your plant, and once you have made a start, you will have to keep at it or costs will climb again. **End**

HOW PLANT ENGINEERS ARE USING PROXIMITY DETECTORS



Because so many readers inquired about the article "Proximity Detector Solves Control Problems," published in our December, 1959 issue, we decided to find out how some plant engineers are using them. The outstanding feature of the proximity switch is that it will operate without physical contact and this advantage has resulted in many ingenious applications in industry. Here are four ideas submitted by readers of Plant Engineering.

Controlling a Belt Conveyor

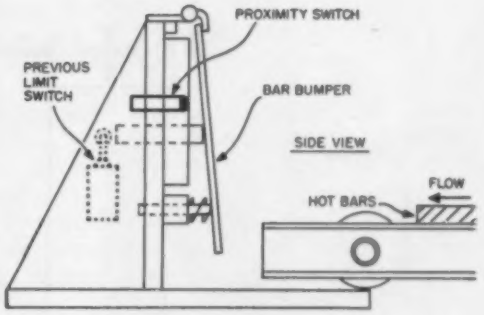


By ROBERT C. HAIN, Material Handling Engineer, Maremont Automotive Products, Inc., Cicero, Illinois

WE HAVE USED two proximity detectors to eliminate signal and direct control wiring over distances of 150 and 300 ft. The detectors tell us when two unloading conveyors are running and permit operation of a feeder conveyor and a packaging machine.

If the unloading belt conveyor stops, the proximity detector relay opens and automatically stops the feeder conveyor and the packaging machine. When it is running again, a signal tells the operator at the packaging machine to re-start his machine and the feeder conveyor.

Operating a Kick-Off Device

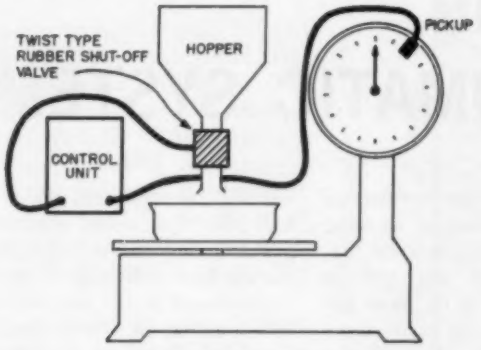


By T. J. McGINLEY, Electrical Shop, Crucible Steel Company of America, Pittsburgh, Pa.

WE FORMERLY used a hinge-type spring return bar bumper on the kick-off device installed on the hot bed of our 14 in. bar mill. As bars on the run-out table hit the spring return bumper, it moved back to operate two limit switches. The hard jar of the bars hitting this bumper would damage the switches after so many operations.

By using the proximity detector behind the bumper, we can sense the position of the bar without any mechanical contact. This application has, to date, saved $800 on material and mill delays.

Batch Weighing of Small Parts

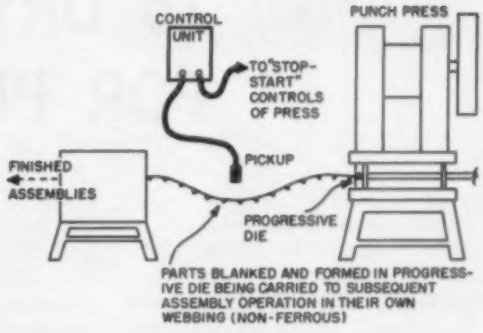


By W. J. ULRICHNY, Forstner Inc., Irvington, N. J.

WE USE A proximity detector for batch weighing of small parts. The parts are placed into a hopper with a gravity feed to the scale pan. The proximity detector pickup is placed on the scale face at the weight required. When the parts are flowing into the scale pan, the scale needle moves until it comes to the point where it trips the proximity detector.

A rubber type shutoff valve, operated from the proximity control unit, shuts off the flow of parts. This valve remains closed until the pan has been emptied and replaced ready to weigh the next batch.

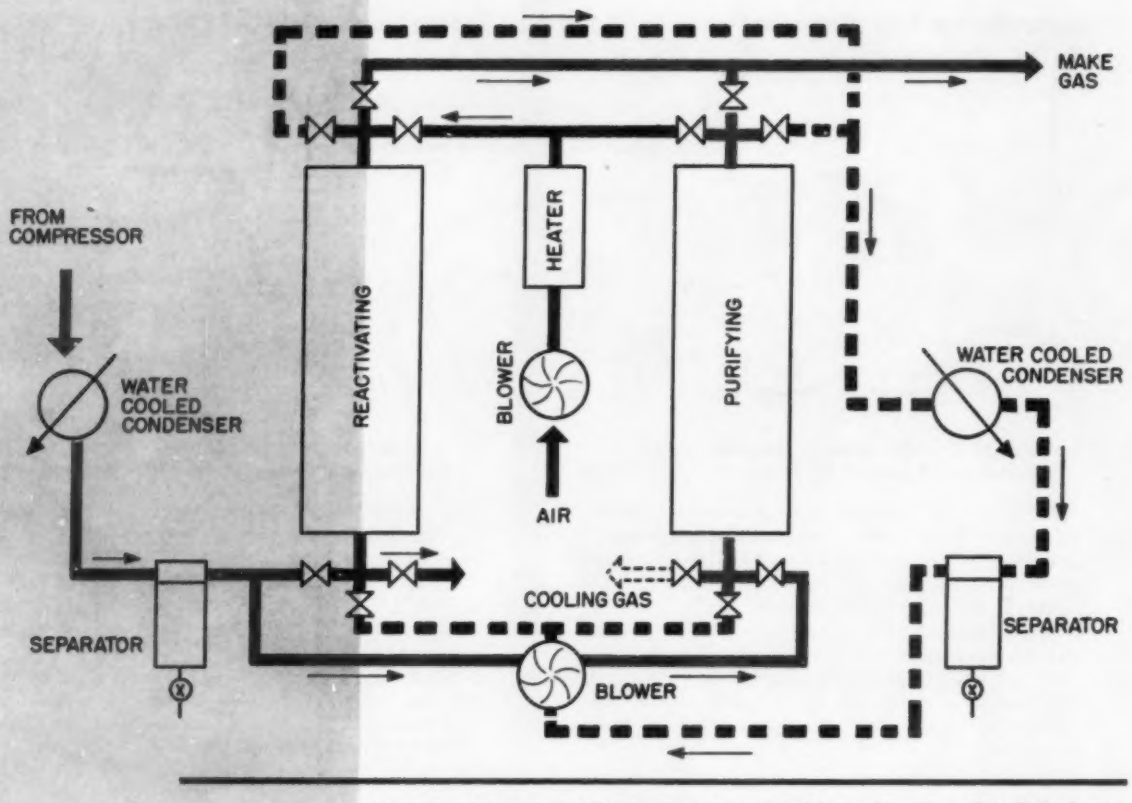
Loop Control on Punch Press



By L. H. PEERY, Engineering Dept., Union Carbide Consumer Products Company, Charlotte, North Carolina

IN THE application shown in sketch, non-ferrous metal parts are blanked and formed in the progressive die mounted in the punch press at right.

Since the production rate of the punch press exceeds that of the assembly operation a means of sensing the loop between them is necessary to start and stop the punch press at the proper times. Also, since the parts being carried in their webbing are quite delicate, it is desirable to control this loop without physically contacting it.



Dual chamber unit is effective for plants requiring a low dewpoint. Dehydrator dries air in one chamber while saturated desiccant is reactivated in the other.

How To DRY AIR FOR PNEUMATIC SYSTEMS

By **H. N. MABERY,**
Robbins Aviation, Inc.,
Los Angeles, California

THERE ARE MANY methods and types of equipment used to remove water and oil from pneumatic systems. The type selected depends upon the pneumatic system to be dehydrated and is affected by the following conditions:

1. Working pressure of the air
2. Flow rate of the air
3. Temperature of the air
4. Required dryness or dewpoint of the air
5. Required maximum oil vapor content of the air
6. Operating period—continuous or intermittent

The ideal location for the dehydrator is between the compressor and the receiver. However, in some applications that may not be feasible. Regardless of the type of dehydrator chosen, it is very important to cool the air as it comes from the compressor. This should be done so that the maximum amount of water and oil vapor will be condensed from the saturated air and can be caught in a simple water separator or mechanical filter which is drained periodically during operation.

The dehydrator then has only to remove the small percentage of water and oil vapor that is left in the air and its capacity to dehydrate is much greater. It is important to note, for example, that 75 F ambient air at only 30 per cent relative humidity, compressed to 100 psi and 100 F, is water saturated and any lowering of the temperature in the air lines will cause liquid water to condense in the air line and be blown out at air nozzle stations.

An important unit of any air drying system is an automatic valve immediately downstream from the dehydrator. This valve maintains at least 75 per cent of the rated working pressure in the dehydrator so that advantage is taken of the pressure to condense water and oil. It is called a priority or back pressure valve. Without this valve the efficiency of the dehydrator is lost and serious damage downstream can result because of excessive flow rate through the desiccant.

In considering the methods of

drying plant air for an average application, there are three major processes that can be used, namely: mechanical, chemical and adsorptive.

Water can be removed from air mechanically by:

a. Increasing the pressure (squeezing it out)
b. Lowering the temperature (condensing it out)
c. A combination of increasing the pressure and lowering the temperature

In this mechanical process the temperature of the air is lowered at the working pressure, thereby removing water vapor by a combination of condensation and pressure. An example of this would be the aftercoolers which are used between the last stage of a compressor and a receiver. In some cases, refrigeration is added to the aftercoolers to cool the air to a lower temperature of approximately 37 F so that more of the water and oil vapor is condensed. The condensation is then trapped by a separator and drained periodically.

For example, if plant air at a working pressure of 150 psig was lowered to 40 F, it would be at an equivalent dewpoint of —15 F at atmospheric pressure and would not condense at any temperature above —15 F.

The mechanical process is most economical if the dewpoint requirement of the air is not too low. The chemical process of water removal is rarely used for plant air as the equipment becomes cumbersome and expensive. In this process water vapor is removed by use of active materials such as phosphoric pentoxide, which combines chemically with water.

Closely allied to the chemical processes are those involving the use of hygroscopic materials such as calcium chloride, glycerin and sugar syrup which take water vapor into solution. These materials usually have a higher boiling point than water and can be reactivated by heating to 250 F, thus boiling off the water and allowing re-use. Dewpoint ranges are limited in this process.

The adsorption process is the most commonly used with plant air requiring low dewpoints and involves the use of desiccants. These desiccants are solid materials that are chemically inert and undergo no changes in their physical state while in use, require no extreme pressure to perform properly and when saturated are easily dried or reactivated for further use by exposure to dry gas at temperature between 250 and 660 F. However, some desiccants will break down when coming into direct contact with liquid water.

If Low Dewpoint Required . . .

For the plant air dehydrator application requiring a low dewpoint, a reactivating type dehydrator is most commonly used. A dual chamber unit, either manual or automatic, will be effective. This type dehydrator dries the air in one chamber while the saturated desiccant is being reactivated in the other.

The reactivation is accomplished generally by two common methods. One method is to introduce a flow of dry preheated gas, heated to the required temperature to reactivate the desiccant being used. The other is an internal heating coil built into the desiccant bed.

In both methods the desiccant bed after reactivation is cooled with a dry gas before being put into dehydrating service. For continuous operation an automatic unit may be desirable, as it will change over from reactivating to drying at a pre-set time and requires infrequent servicing.

The average dewpoint obtainable with this type drier is in the range of —65 F.

When a low dewpoint, such as —100 F or lower is required, the combination of refrigeration and desiccant type dehydrators is usually the most economical.

Fortunately, there are a number

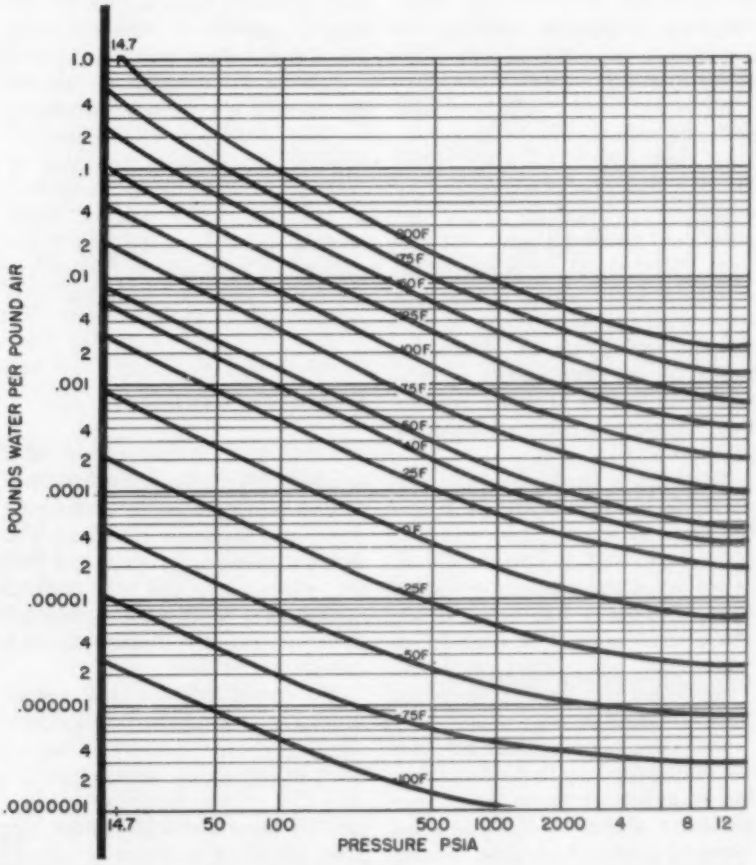
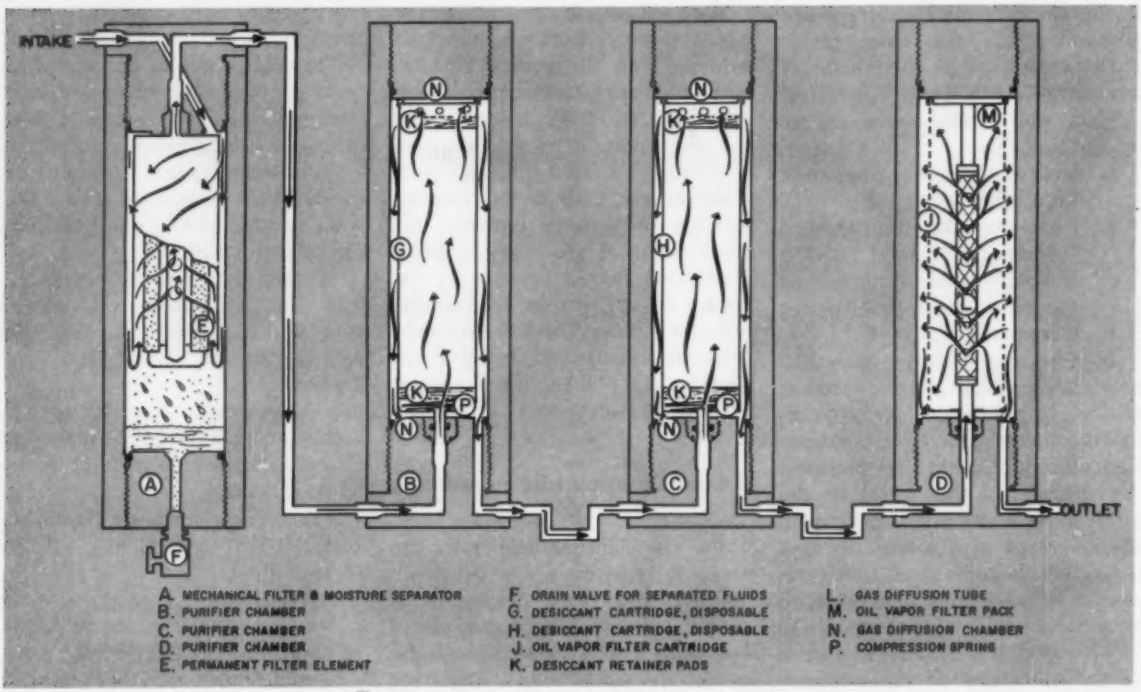


Chart shows water in saturated air at various pressures and temperatures.



For uniform high pressure drying, cartridge type dehydrators consisting of a mechanical filter separator and two to four purifier chambers is recommended.

DRY AIR

of types of desiccants available which the dehydrator manufacturer can use for removing oil and water vapor from air.

Molecular sieve, silica-gel and activated alumina are the desiccants most commonly used today. Each has a definite performance feature distinctive to itself in drying applications. Molecular sieve will perform effectively at air temperatures as high as 250 F and is available in three types for selective removal of oil and water vapors. Molecular sieves do not break down in contact with liquids. The reactivating temperatures are high, requiring 360 to 660 F.

Silica-gel is used when air temperatures are held below 90 F and oil vapor removal is not stringent. It is reactivated at 250 to 300 F. When liquid water comes in contact with silica-gel it will break down. Put a small amount of silica-gel in your hand, place water on it and you will see the silica-gel snap and pop into small pieces.

Activated alumina does not have the drying capacity that either silica-gel or molecular sieves do at temperatures above 70 F. With most types of activated alumina, dusting is a problem. However, better oil vapor removal is obtained with this material than with silica-gel.

Laboratory installations requiring uniform high pressure drying of air, nitrogen, oxygen, hydrogen or helium with working pressures of 3000 to 12,000 psi, and dewpoints as low as —100 F with oil vapor content less than 0.3 parts per million by volume, are ideal applications for the cartridge type dehydrators.

Disposable Cartridges

These units usually consist of a mechanical filter separator and two to four purifier chambers employing disposable desiccant cartridges. The systems are lower in initial cost than the other types and will perform consistently, as maximum efficiency is maintained by proper cartridge changes.

To obtain the required results, a selective combination of desiccant cartridges can be used in series, such as molecular sieves, type 5A and 13X, to remove the water vapor and oil vapor and a glass pack type filter oil vapor cartridge to remove the final minute concentrations of all vapor and also all particles down to 0.1 microns. This type of dryer is also portable which adds to its versatility.

In some applications the refrigeration type dehydrators are used upstream of a disposable cartridge dryer which then can achieve a —100 F dewpoint with inexpensive silica-gel cartridges. Cartridge life will vary from 5 to 40 hours depending upon the amount of water to be removed, the temperature of the gas and flow rate.

Remember that the size of any of the types of dehydrators which you may be considering should be determined by the following:

1. Working pressure of the air (the higher the pressure the smaller the unit).
2. Flow rate (the higher the flow rate, the larger the unit).
3. The temperature of the air delivered to the dehydrator (every 20 F increase doubles the size of the unit).
4. Dewpoint required determines whether a mechanical or a desiccant type system should be chosen.
5. The oil vapor content required in the air. **End**

SPECIFYING PLASTICS?

Check These Properties of the Plastic Families

By **ALBERT SNIDERMAN**, Consulting Engineer, Director, Mobile Testing Laboratory, Detroit, Mich., and **GEORGE CARLYON**, Vice President, Engineering, Cadillac Plastic & Chemical Co.

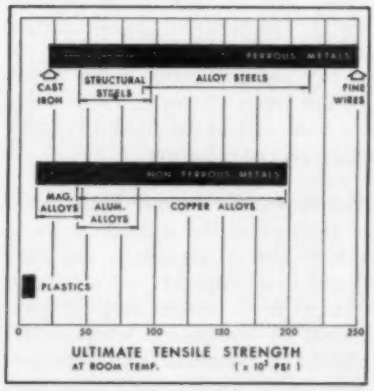


Fig. 1.

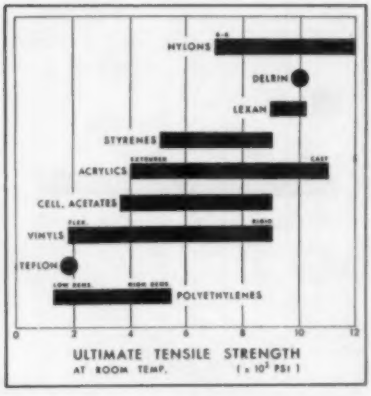


Fig. 2.

BY COMPARING the more important mechanical and electromechanical properties of plastics with the same properties of the better-known ferrous and non-ferrous metals, we can see where plastics belong in the spectrum of engineering materials and apply them with the highest probability of success.

Such a comparison of these two families of materials will help the engineer to specify plastics, when called for, with no more conscious effort than is required when he specifies a metal.

Plastics normally available to the user directly out of warehouse stock are perhaps most important because of their greater distribution. They have been chosen for presentation in this article.

In a general introduction to plastics as engineering materials, reference to special formulations and combinations would be confusing, and therefore only the basic formulations are treated here. Filled materials, plastic films, molded forms and fabrication techniques are also important, and thorough acquaintance with them is recommended as a profitable sequel to this introduction.

Names of plastics are those generally used commercially. Of these, some are generic names. Delrin and Teflon are DuPont trade names for acetal and tetrafluoroethylene resins and commercial shapes produced from these resins. Lexan is the trade name of General Electric polycarbonate resins and shapes made from them. Delrin and Lexan are only now becoming commercially available.

In the charts, the properties of some plastics are given as ranges, while those of others are more specifically identified. This is because some of the plastics are really families of closely related individual formulations, and for this reason

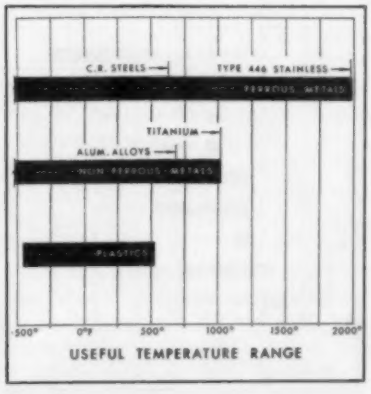
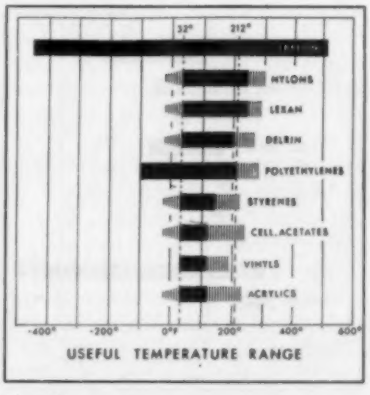


Fig. 3.



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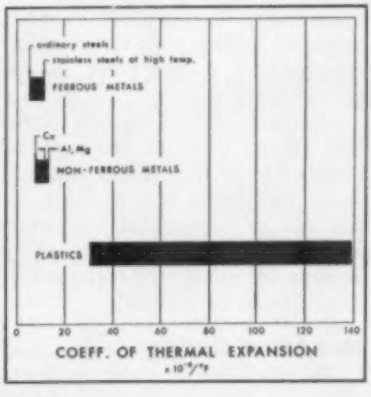


Fig. 5.

the name of the family is used in the plural: nylons, styrenes, acrylics, acetates, etc.

The properties which follow are by no means the only useful engineering properties of plastic materials. But it is believed they are the most significant in examining the suitability of a given material.

Ultimate Tensile Strength

Ultimate tensile strength (see Figs. 1 and 2) has been selected as a basis of comparison, as the most commonly used concept of strength, although in many situations, designers may be more interested in other criteria such as yield strength, fatigue strength, impact strength, etc.

Where weight is important rather than physical size, the strength of plastic materials in pounds per pound of material can be much more favorable than indicated on this chart.

Unlike the metals, ultimate tensile strength, like many other properties of plastics, varies with the ambient temperature, the strength decreasing with increasing temperatures.

Though strength of nylon may be only moderately high, it has extremely good toughness in all formulations. Flexible tubings made with nylon have burst strengths up to 4000 psi. Some of the vinyl materials have good strength but they tend to be somewhat notch sensitive: when over stressed, they tend to craze. Vinyl, polyethylene, styrene and the cellulose acetates are ultra-violet sensitive and tend to weaken or craze on outdoor exposure. This is overcome, in many cases, by adding ultra-violet inhibitors, such as carbon black, to the formulation.

Designers will get the best fatigue and impact strength from plastic components if they follow common metal practice in design. Sharp fillets are to be avoided and stress relievers are to be used where sharp corners or other stress concentrations cannot be avoided.

Modulus of Elasticity

The modulus of elasticity of engineering materials gives an indication of the stiffness or how much deflection we can get or expect from a given loading. The charts show the usual modulus, or deflection on short term loading.

However, when this load is applied for some period of time, an additional deflection, usually referred to as creep or cold flow, is experienced. Fortunately, most materials exhibit creep only for a finite period of time and beyond this period, there is a negligible flowing. The modulus of elasticity computed on the basis of the long term deformation including cold flow is the apparent modulus of elasticity.

When parts are loaded intermittently, the visual modulus should be used to calculate deflections. When parts are loaded continuously, then the apparent modulus should be used.

Since plastics will deflect to a much greater extent than will metals under the same loading, it is important that metal and plastic parts do not share loads in parallel since the plastic part will refuse to accept its share simply by deforming itself.

Useful Temperature Range

On increasing the temperature of some plastic materials they become softened to the point where they are unable to bear the required loads. On further increase in temperature they may be unable to retain their own shape. This class of materials is referred to as thermoplastics and materials discussed in this article are of this type.

Another group of materials does not experience this softening on increase of temperature, but reach the point of thermal degradation of the molecular structure first. Such materials are referred to as thermosetting plastics. Some of the more common thermosetting plastics are the phenolics, melamines, polyesters and epoxies.

The addition of a heat-resistant filler material, such as metal or glass fibers or glass fabric, will raise the continuous exposure limit of most plastics. Useful temperature ranges will be higher for intermittent than for continuous exposures.

For any application in the region of the limits shown in Figs. 3 and 4, tests should be used to justify the material selection.

Coefficient of Thermal Expansion

Because of the wide disparity in coefficients of expansion, see Figs. 5 and 6, any assembly of metal and plastic parts which may be subjected to fluctuating temperatures should be examined to prevent malfunction at temperatures other than the original assembly temperature.

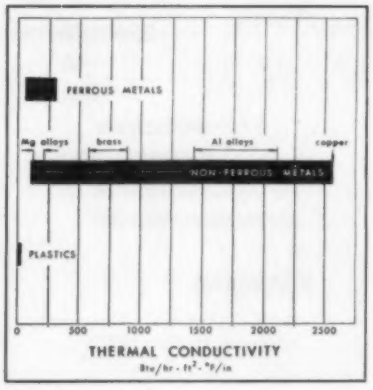


Fig. 7.

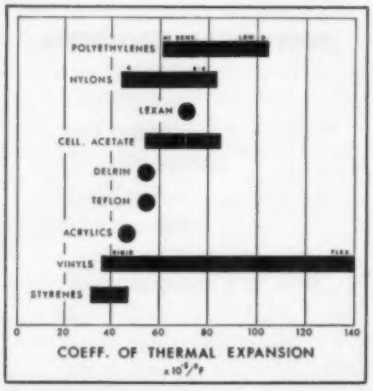


Fig. 6.

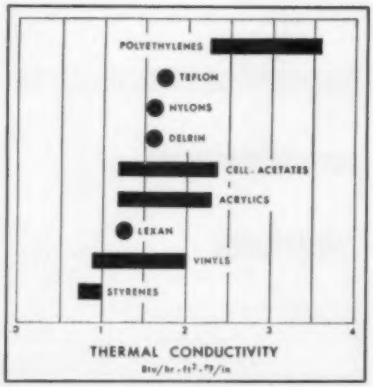


Fig. 8.

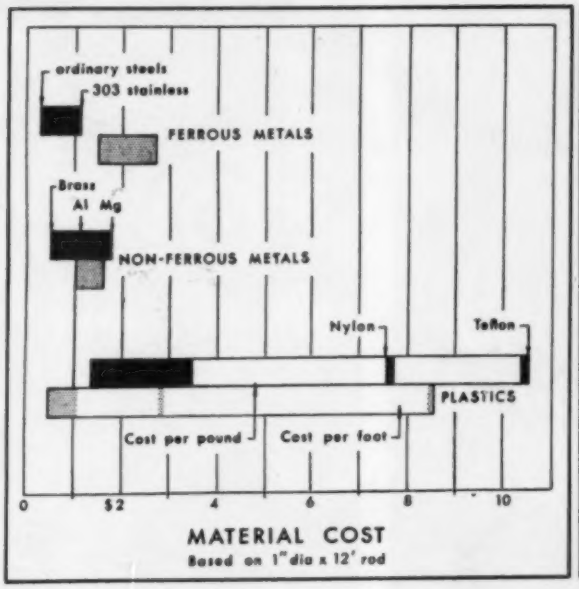


Fig. 9.

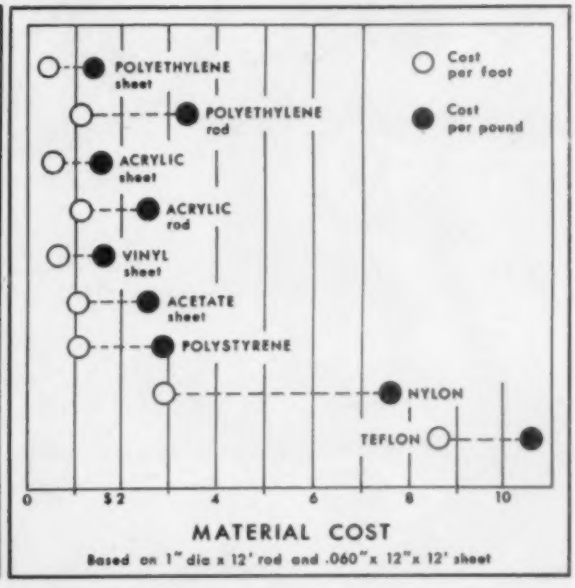


Fig. 10.

In a mechanical component in which a plastic part is completely contained within a metallic member, increasing temperatures can place the plastic parts under unduly high compressive stresses. If the plastic part is only partially contained, increasing temperatures may cause extrusion of the part to the open side. A long slender rod of plastic fastened at one end to a metallic structural will tend to buckle when subjected to increasing temperatures.

Accurately machined parts must be measured at the temperature at which the size is important. Because of the high coefficient of thermal expansion, accurate parts at one temperature will be well outside their tolerance range at different temperatures.

Thermal Conductivity

In the property of thermal conductivity, see Figs. 7 and 8, plastics behave in a manner opposite to that of metals: they insulate rather than conduct heat.

When used as a bearing surface, for instance, a plastic material will not conduct heat away from the rubbing surface as fast as will some metallic bearings. It is necessary to use a technique such as backing up by a thin section of metal to improve the over-all conductivities.

Plastic materials make good high temperature heat shields when used for short periods. As temperatures rise, radiant heat becomes a more important factor. A plastic heat shield exposed to a radiant heat source would soon become hot at its surface and might suffer surface degradation, but because of its low conductivity this heat will not be transmitted to its opposite surface at a very great rate. Consequently this opposing wall or surface will stay relatively cool and radiate very little heat to the item being protected. This is opposite to the way in which a steel or metallic shield would function.

Coefficient of Sliding Friction

The coefficient of sliding friction is only one factor to be considered in selecting bearing materials. Other factors are abrasion resistance of the material, wear, life, deflection, etc.

As may be observed, the coefficient of sliding friction for nylon or Delrin, when lubricated, is not much better than other common bearing combinations. The real advantage of these materials is their ability to maintain the coefficient of sliding friction under more adverse conditions and with less total lubricant. If abrasive particles get on the bearing surfaces they tend to imbed themselves in the plastic and therefore do not damage the bearing surface, which still maintains the low coefficient of friction. Under similar conditions, metal to metal bearings would soon become scored and fail.

Teflon is the glamor material in this field, because without the need for a lubricant, it exhibits a coefficient of sliding friction much lower than any other combination of materials. While not shown on the chart, polyethylene has some good friction properties which might make it suitable for certain plastic bearing applications.

Resistivity

Like thermal conductivity, resistivity of plastic materials is very low compared to that of metals. Therefore, we compare them with common electrical insulators on a chart with a logarithmic scale.

The plastics are considerably tougher and more easily fabricated than commercial insulation materials like mica, glass and porcelain. Enhancing their desirability as insulating materials, most plastics also have excellent chemical and aging resistance.

There is not too great a variation of resistivity for most of the plastic materials. Teflon, because of its inertness to all solvents and higher useful temperatures, is used to a considerable extent in electrical applications. Polyethylene, because of many useful electrical properties and low cost, is also popular in this field.

Dielectric Strength

Dielectric strength shows the ability of a material to withstand high

(Continued on page 240)

Vari-Sized Parts and Assemblies Handled in PLANT WITH PLANNED FLEXIBILITY

FOR ALMOST 60 years job-shop techniques have been the rule in the manufacture of circuit breakers for high-voltage transmission and distribution circuits. In early 1960, however, completion of a new plant at Trafford, Pa., designed specifically for circuit breaker manufacture enabled Westinghouse Electric Corporation's power circuit department to change over to in-line production and assembly.

In this new 370,000-sq ft facility, circuit breakers and major components are progressively assembled on multi-station lines. In many cases, this approach was also followed for testing and parts production. To make this possible, conveyorized multistation assembly lines were designed to accommodate parts and assemblies of widely differing shapes and sizes, and production machines were selected and placed to provide the greatest possible degree of production flexibility.

Detailed planning for this plant got under way when 30 committees were made responsible for planning specific areas that were needed in the new plant.

The general philosophy under which these committees were instructed to function called for them not only to eliminate production problems that had existed in the foreman's department but also to make the fullest practical use of modern production techniques to go beyond mere problem solving.

Here are highlights of some of the operations to give you an idea of how the plant can handle a variety of circuit breakers.

At one major point of use, incoming, plate is delivered to an installation of two 8-by-16 ft electronically guided gas burnout machines joined back to back so as to accommodate two 20-ft plates. Equipped with tracer heads and supplied with natural gas, these two independently controlled machines automatically burn parts from plate once their scanning heads are positioned over the drawing to be followed. Tolerances are in the order of 1/64 in. See Fig. 1.

Prefabricated in an area just off the tank line, tank dome assemblies are produced on a five-station carousel whose assembly fixtures are suspended from an independently powered overhead monorail conveyor by carriers that can be tilted to facilitate downhand welding. See Fig. 2.

After the tanks are welded to foundation beams, they are moved by overhead crane into a 19-by-42 ft downdraft paint spray booth for application of a primer and a preliminary finish coat. This booth is unusual in that it does not use the conventional standing pool of water to settle sludge; instead, sheets of water flow constantly over the sloping sides of the trough below the grating floor and sump at the low end of the trough contains weirs, screens, and pumps.

To permit the painter in this booth to work effectively over and around large breakers, the paint

Fig. 1. Left: Automatic gas burnout machines are electronically controlled.

Fig. 2. Above: Domes for tank shells are fabricated on five-fixtured conveyor.

Fig. 3. Right: By providing painter with one-man elevator, he has better access to upper surfaces of breakers.

booth is equipped with a man-hoist suspended from a small bridge crane and controlled by the painter from a pushbutton station in the man-hoist. See Fig. 3.

Among the various machining sections producing components for a specific product line is a programmed machine-tool center for the production of parts for floor-mounted high-voltage circuit breakers. At this center, repeat orders are quickly put into production by loading the numerically-controlled machines with programs kept on permanent file for each job. See Fig. 4.

One of the sections organized on a specialty basis near the programmed machine center, is a new completely integrated facility which cleans and brazes several hundred kinds of brass, bronze and copper parts ranging in weight from 1 to 300 lb. The system is built around a closed-loop conveyor system which links together a storeroom, an automatic cleaning and bright-dip machine, and three different brazing processes (induction, radiant gas, automatic radiant gas).

In the storeroom, parts are loaded into stainless steel baskets which then travel through bright-dip to any of the three brazing stations. At these stations brazing operators select their work and on completion, return the assembled parts with the same baskets.

The conveyor carries parts back to the storeroom for rerouting through the automatic machine for final cleaning after brazing when necessary. Assemblies may then be dispatched to plating or assembly as a completed brazed part.

After parts and assemblies are produced in the three feeder aisles (tanks, cabinets, frames, etc.) and in the machining area, parts to be painted merge at the entry end of a conveyorized paint-finish system of unusual versatility and compactness.

Spray painting and parts loading and unloading are the only manual activities in its operation. The system includes a five-stage washer-phosphate unit of the cabinet type; a dry-off oven; a dual-position spray paint booth; and a bake oven.

In loading its overhead monorail conveyor, parts are suspended on carriers, each of which is designed to transport a number of parts of similar size. These loaded carriers are suspended from 14 master hangers on the conveyor; flags on each master hanger are set by the operator to determine what finishing sequence will be applied to parts on that carrier.

By positioning these flags, the operator can route the parts through the normal sequence of steps, namely wash-and-phosphate, dry, paint, and bake, or he can eliminate both the dry and the wash-and-phosphate operations so that the parts will pass only through the paint and bake stations. Through this arrangement as many finish coats can be applied as are necessary.

In addition to its automatic cycling, the system includes unusual provisions to prevent intercontaminations of the five different solutions used in the wash-and-phosphate unit.

The five solution pumps involved are electrically interlocked and a funnel-type trough in the wash-and-phosphate cabinet indexes below the conveyor and in synchronism with it to collect the spray solutions for return to their proper storage tank.

Further, the monorail conveyor

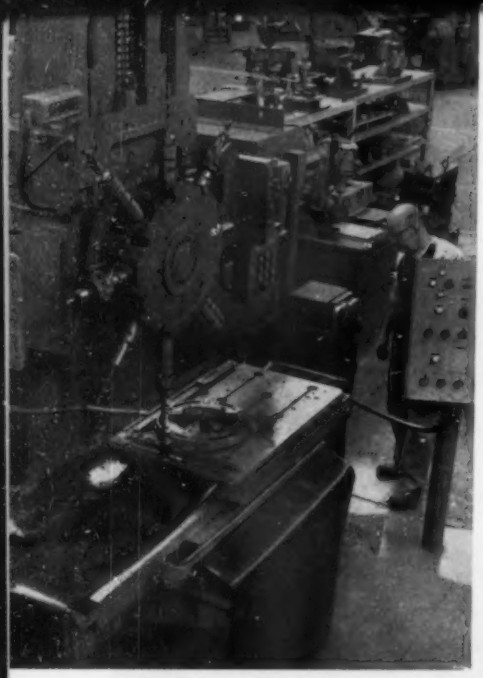


Fig. 4. This eight-spindle turret drill is one of two tape-programmed turret drills in plant's machine tool center.

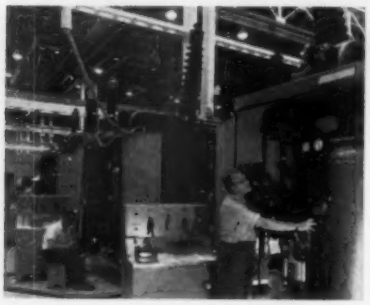


Fig. 5. Special equipment has been installed to reduce the time to test circuit breakers. Shown are four test stations.

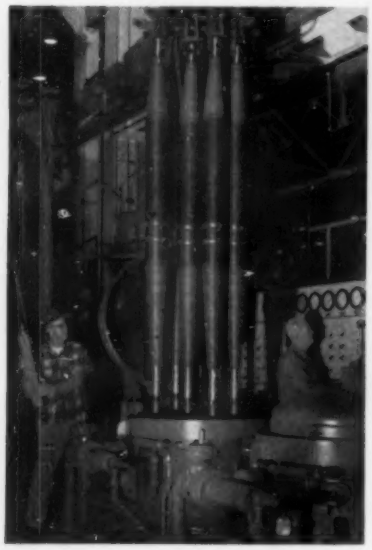


Fig. 6. To impregnate bushings, they are suspended in clusters from a steel spider, then lowered into well area.

was designed so that its mechanism is protected from solutions in the wash-and-phosphate cabinet, from overspray of paint in the paint booth, and from heat in the bake ovens. Slots in the top of each of these compartments enable the carriers to pass through seals which bar chemicals, paint and heat from moving parts.

After assembly, the breaker mechanism is prepared for test by fitting it with a specially designed quick-connect terminal block. A major test performed on the mechanism alone is carried out by an automatic test device which checks all circuits according to instructions supplied in punch tape

Typically, the tester will sequence through 60 continuity and resistance checks. For each check, indicator lights show whether values are low, high, or acceptable; numerical values are displayed by Nixie read-out tubes. After electrical and mechanical tests, the mechanisms are transported to the breaker assembly aisle where they will join other components as the brain and muscle of a fully assembled breaker. See Fig. 5.

The most extensive and versatile bushing line in the plant is a 250 ft long, 10-work station elevated conveyor for progressive assembly of large oil-filled bushings at three vertical working levels. Bushings assembled on this line begin as long rolled cyliders of special paper in which sheets of aluminum foil have been interleaved during winding. After rolling, the cylinders are lathe-tapered at each end and stored in a five-drawer steam-heated oven to bake out moisture preparatory to their impregnation with oil.

Equipment for impregnating the cylinders (condensers) is a pair of underfloor tanks, with 60 in. diameters and 18 and 23 ft deep. Clusters of condensers to be impregnated are lowered into one of the tanks from the spokes of a steel spider, the tank covers are closed to give a hermetic seal, and the automatically sequenced impregnation cycle is initiated. See Fig. 6.

First, the condensers are subjected to high vacuum for 10 to 18 hr and then impregnated with heated, degassed oil at a pressure of 100 psi. After 3 to 12 hr atmospheric pressure is restored in the tank, the bushings are removed and loaded on the 9-ft-high assembly conveyor by jib crane.

After testing, the bushings are returned to the power-driven return loop of the conveyor, painted and transferred to the assembly area for oil-filled (high-voltage) circuit breakers.

Immediately adjacent to the area for operational testing are facilities for extremely high-voltage tests of insulation. Energized at 4800 v either from a 1250-kva motor-generator set or a 500-kva step regulator, this installation of three 350-kv, 700-kva transformers, in cascade, has maximum rated output of 1,050,000 v.

Available for calibration of voltage output of the system are two 100-centimeter aluminum spheres, one of which is at output potential, the other at ground potential through a 1.2 megohm resistor. See Fig. 7.

In the final production operation prior to shipping, breakers move from any of the three test areas to paint booths for final and touchup painting.

From painting, the complete breakers are moved to the shipping area where they are made ready for shipment to their destinations from rail and truck docks. **End**

Fig. 7. Two spheres at upper center function as a flashover gap for calibrating voltage output of transformers.

TECHNIQUES FOR CLEANING FILTER ELEMENTS

By FREDERICK GRUNER, Director of Engineering, Purolator Products, Inc., Rahway, N. J.

SOMETIMES, FILTERS are installed merely to assure cleanliness of a stream in the unlikely event that any contaminant appears. More often, the stream definitely contains contaminant which must be removed from it. Ideally, the amount and nature of this material will be fairly well known.

What to do with the material once it has been separated from the stream may become a complex problem. A traditional solution is to discard the filter element once it has become loaded. This, of course, is customary in the case of the conventional automobile lubricating-oil filter.

For industrial processing, however, it is often impractical to open up a filter case for service. Even when the case can be opened without undue trouble, there are many times when it would be better to clean caked elements for re-use than to discard them.

Removal of elements or element assemblies, cleaning off caked contaminant and replacing the cleaned elements in their case will certainly take a significant amount of time. Unless it can be handled during a shutdown period—on an off shift, for example—there would be a strong argument in favor of having at least one other filter available to pick up the load.

Consider Multiple Units

Duplex or multiple filter units will be possibilities to consider whether filter elements are discarded and replaced, taken out for cleaning or cleaned in place. The factor here is how much of an interruption can be tolerated.

With a duplex arrangement, for continuous flow, one filter unit would always be on the line while its mate would be isolated by suitable valves and available for maintenance or element cleaning.

Another typical arrangement is the one where element cleaning is accomplished by backflowing. With a light, dusty contaminant carried by a gas flow, as short a time as one second may be all that is required for each element-cleaning backflow interval. Such a short flow interruption might well be tolerated—even in processes that are nominally "continuous." Thus a single filter unit would suffice.

However, even where the backflowing element-cleaning interruption is extremely brief, duplex or multiple filter installations are used. Sometimes this is because any flow

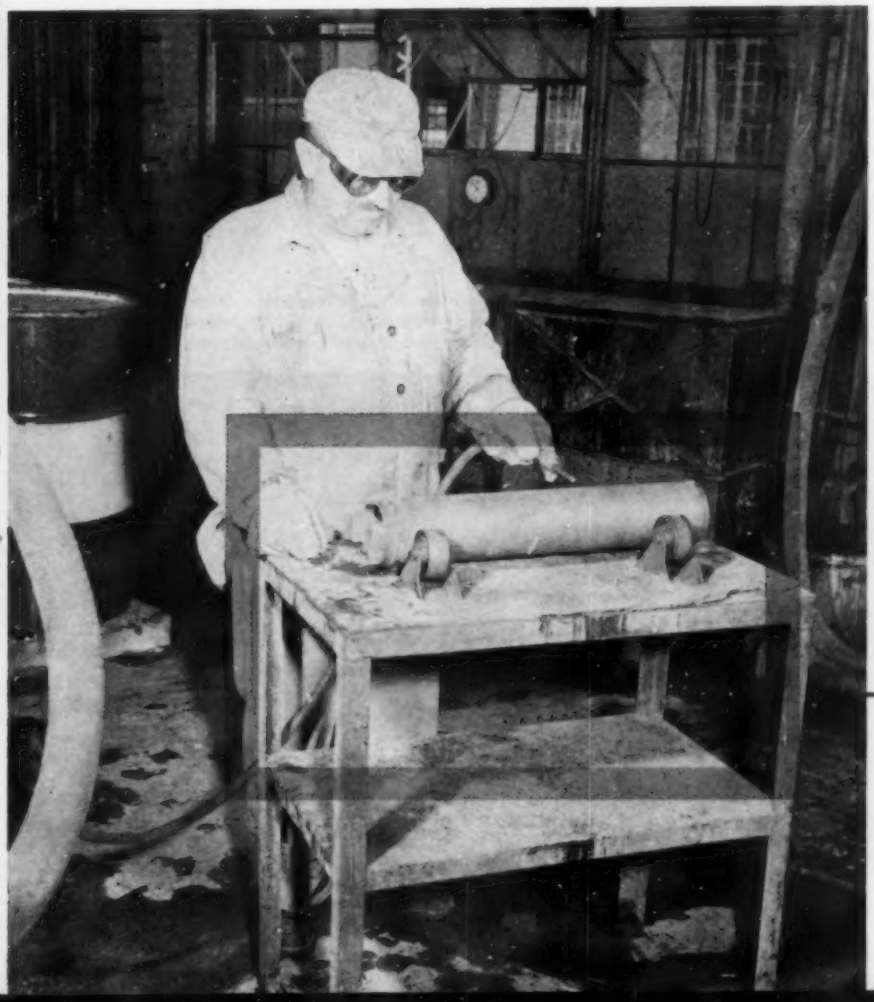


Fig. 1. At Union Carbide Plastics Company, metal-edge filters have been operating on a semi-continuous basis since 1950. Here, James Peters, utility man, blows air through filter to make sure all contaminants are removed.

interruption, no matter how brief, is objectionable. Other times, the reasons have to do with piping convenience, desirable size of filter units or a wish to enhance reliability by using multiple units at all stages of a system.

Thus, we find duplex or multiple filter installations made for a variety of reasons, but most often to provide for continuous flow despite service interruptions for element cleaning.

Discarding filter elements is a practice that can be justified in two ways. One is in terms of the cost of the elements themselves. Some types of elements—resin-impregnated cellulose for example—are relatively inexpensive. For many types of service it costs less to discard them than the cleaning might entail.

The other justification for discarding instead of cleaning an element is that depth filtration, contrasted with surface filtration, leaves the contaminant material so thoroughly dispersed through the filter medium that its removal is extremely difficult if not practically impossible. The packed waste type of filter used extensively in the past is an example of where this would hold true. Among the media of current importance, some of the absorptive and adsorptive materials are discarded and replaced instead of being cleaned or regenerated.

Presence of radioactive wastes in filtered-out contaminant material might make its recovery imperative —or add to the urgency of filter element disposal— depending on circumstances of the individual process and the elements involved.

Backflowing is a filter cleaning method that affords good results whenever it is undesirable or impractical to open up a filter case and throw away—or even clean mechanically—a caked filter element. In general, light, dusty contaminants are easier to remove by backflowing than sticky, gummy ones.

Pressure in the reverse direction is momentarily exerted on the element to dislodge the contaminant cake. Often pressure is applied as an impulse or in shock waves. At the same time, a discharge outlet is opened at the bottom of the filter case. This discharge line is maintained at a slightly lower pressure than the case, so that material forced off the element surfaces is carried away. So will any other contaminant material separated out of the stream dynamically or by gravity. The pressure in the discharge line must not be so low that excessive reverse-direction differential pressures are imposed on the elements.

Success of the backflowing technique depends, first, on keeping all forward flow velocities through the surface-type filter medium—and hence the pressure drop across it—low enough so that particles will not be driven violently into the element's pores. If the contaminant becomes firmly embedded deep in the structure of the filter medium, it then becomes impossible to drive it all back out again without resorting to extreme backflow pressure.

How often to backflow depends on the contaminant buildup rate. It is measured by increase in $\triangle P$, using a clean-filter $\triangle P$ as a reference. Best practice is to backflow when $\triangle P$ rises to a value from 6 to 12 times that of the clean-filter figure.

In a system that delivers contaminant to a filter at a fairly constant rate, it may be convenient to backflow at a set time interval. The time interval may be as long as a day or a shift. It may also be as short as one minute or less.

When the backflow interval is short, the operation becomes too repetitive to justify manual opening and closing of valves. For such installations, where large quantities of contaminant are handled, it is customary to use an automatic valve arrangement.

Cam-operated valves—or sole-

Fig. 2. Sump draining of filter takes place every three hours after a 20 minute cleaning with scraper blades. Previously, filter press—sawdust filtration—was cleaned every hour.

Fig. 3. Visual inspection of filter elements is prescribed to insure top efficiency. Filters purify liquid phenolic resins ranging from the highly viscous to the relatively fluid.

Here are some of the ways in which the filtered-out contaminant material may be handled:

1. **Discarding the filter elements after use.**
2. **Backflowing of the filtered fluid.**
3. **Backflowing with another liquid or gas.**
4. **Solvent-washing the elements in place.**
5. **Scraping with a doctor blade.**
6. **Removing the elements for soaking or scrubbing.**

noid-operated valves controlled by a timer or pressure-sensing device —momentarily shut off the normal outlet flow, apply one or more bursts of pressure to the filter at its outlet connection, and open the bottom contaminant discharge. The normal filter inlet may or may not be shut off during this backflowing procedure.

Whether to do so can be decided in terms of how the pressures balance out between filter inlet flow and contaminant discharge. Whether inlet flow loss into the contaminant discharge is objectionable will also be a factor.

It should be noted that backflowing makes the filtration process an intermittent one—even though the actual flow interruption may amount to only a second or two with automatic valving. If this short-time stoppage of steady-state flow will have adverse effects on associated processes, then a duplicate or multiple filter setup is indicated.

An actual installation of this type can be cited as an example. A bank of six filters removing contaminant material from a continuous flow of nitrogen gas is served by mechanically-timed automatic valves. Two of the six filters are backflowed at a time. The cyclic interval is one minute—58 seconds forward and two seconds backflow.

Solvent-washing elements in place in the filter case can be done. This is actually a modification of the backflowing idea, but it demands a piping arrangement that will cut the filter off from its regular flow while solvent is being circulated through it.

Many types of contaminant material that form adherent cakes can be removed readily by the right solvents. The action may be one of dissolving or entraining the contaminant. Sometimes, actual chemical attack breaks down the contaminant material.

Use of such active cleaning materials as acids or strong alkalies will result in attack on the filter itself unless the elements, case and other parts are made of suitable materials. Therefore, the possibilities in this regard should be anticipated when filter materials are selected. Ordinary solvents such as light hydrocarbons pose no problem. However, chemical cleaners are an entirely different matter. Filter media are available to permit their use, but advance planning is essential.

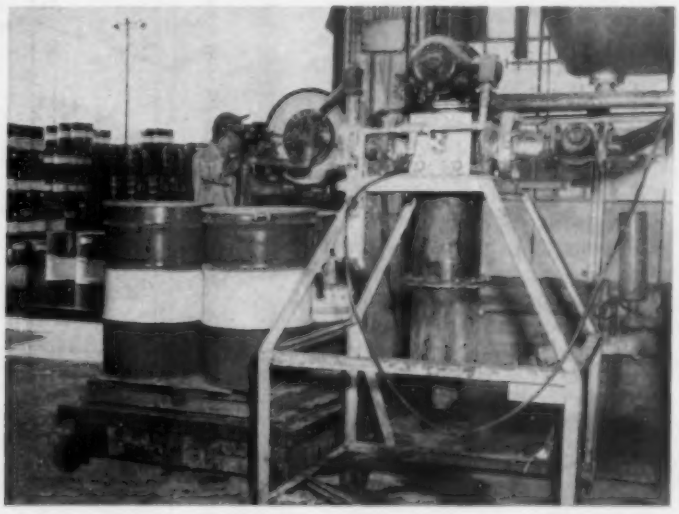
Various Cleaning Arrangements

Considerable flexibility is possible in setting up the cleaning arrangement. Usually, the filter is isolated from its normal flow by closing appropriate valves. Then, the cleaning fluid is admitted at the outlet side of the elements and backflow toward the inlet side. It may be recirculated in some cases or allowed to remain for some time in the filter to soak through the contaminant cake. Often, a final washing with clean solvent is necessary.

(Please turn page)

Fig. 4. Metal-edge filter is put back in service after cleaning. In operation, scraper blades remove contaminants from exterior surfaces.

Fig. 5. Mounted on portable stands, metal-edge filters are used to filter phenolic resin as it is fed into 50-gal shipping drums. According to Union Carbide Plastics, filters have reduced downtime and improved quality.



CLEANING FILTER ELEMENTS

Scraping with a doctor blade is a familiar way of cleaning filters.

Fused porous metal and fused metallic fibers would have their pores burnished shut if an attempt were made to clean them by scraping action. Thus, this method does not apply to metal-edge elements with fused metal coatings or to self-supported fused metal elements.

For many reasons doctor blade cleaning is impractical with all the other principal types of filter elements discussed here. Thus, it is strictly limited to cleaning metal-edge elements other than those faced with porous metal.

Removing elements from their filter cases for soaking, scrubbing or other cleaning procedures is often the most practical way to approach the problem.

Especially in a small duplex installation—where one filter unit is always available for removal and cleaning regardless of continuous operating requirements—this procedure can prove advantageous.

Larger filtration equipment with multiple elements requiring crane service for handling may be piped for duplex operation, but their disassembly for cleaning should be studied to be sure it is worth the time and trouble involved.

Actual solvents, cleaners or chemicals used, of course, will depend on what kind of material must be removed. Whatever is used should be chosen with regard to the materials of which the elements and their fittings are constructed.

The need for cleaning or for discarding a filter element, always depends on how thick a cake of contaminant it has accumulated.

In all cases, this buildup is measured by the amount that the operating differential pressure has increased, compared to the value it had when the filtering element was clean. **End**

DETERMINING COOLING TOWER WATER TEMPERATURE

By HARRY L. BRYMAN, Mechanical Engineer, Brooklyn, N. Y.

DO YOU KNOW the temperature of the water leaving your cooling tower? If not, the following nomograph will prove helpful.

Here is an example to show how to use the nomograph. (The formula used is empirical and gives the approximate temperature of the water leaving the cooling tower.)

Question: How would you determine the temperature of water leaving the tower if the temperature of the water entering the tower is 95 F with the following atmospheric conditions of 95 F dry bulb and 76 F wet bulb?

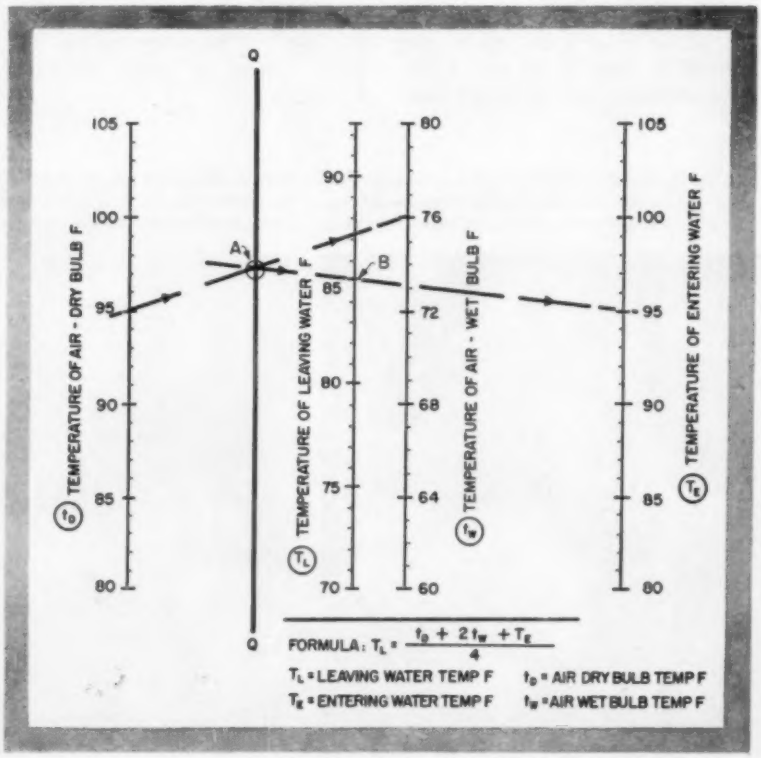
Answer: Connect point 95 on the scale t_d with point 76 on the scale t_w, intersecting line QQ at point A. Then, connect point A with point 95 on scale T_e, intersecting scale T_l at point B, giving the temperature of the water leaving the tower, 85 F.

Taking this figure 85 F—and using it in the following formula:

$$\frac{T_e - T_l}{T_e - t_w} = \frac{95 - 85}{95 - 76} = 53$$

we can determine the per cent of cooling tower effectiveness. **End**

By plotting the entering, dry and wet bulb temperatures on the nomograph, you can easily find the temperature of the water leaving the cooling tower.



Research Reduces Plastic Yellowing — LIGHTING DIFFUSERS STAY WHITE LONGER

Fig. 1. Accelerated exposure tests on plastic samples are conducted in this Fadeometer. Nine hundred hours in this cabinet is equal to eight years exposure to cool white fluorescent lamps.

By P. H. ESTES, Engineer,
The Dow Chemical Co.
Midland, Michigan

YELLOWING of polystyrene plastic, widely used as a fluorescent light diffuser, occurs when oxygen attacks the polystyrene molecules and breaks the bond between the carbon and hydrogen atoms. This oxidation type process is speeded up by the presence of ultraviolet light radiation. If the oxygen or ultraviolet radiation can be eliminated or their effects counteracted, the yellowing rate of polystyrene plastic would be significantly reduced.

Research programs at The Dow Chemical Company not only investigated the causes for yellowing of polystyrene when subjected to fluorescent light radiation and the design of additives to inhibit such yellowing, but also investigated the accelerated testing of thermoplastic moldings to determine their commercial usefulness.

Polystyrene producers have for many years, incorporated anti-oxidants and/or ultraviolet stabilizers into polystyrene. Dow has chosen to incorporate both an anti-oxidant and an ultraviolet stabilizer in the recently introduced Styron Verelite plastic material. The anti-oxidant ties up the oxygen molecule before it attacks the polystyrene and the ultraviolet stabilizer counteracts the effect of the ultraviolet radiation from the fluorescent light source. Such light stabilized polystyrene is being successfully used in fluorescent lighting fixtures.

Perhaps the best way to evaluate the effectiveness of a light stable polystyrene in a light fixture would be to expose the material to fluorescent tube radiation. However, since these materials are expected to have a life expectancy of over 10 years, this would be too time consuming. For practical screening purposes, some kind of accelerated test is required.

The Atlas Fadeometer, Fig. 1, has been specified by an IES-SPI-NEMA subcommittee as the test device to be used in determining the acceptability of a material for lighting fixture use. This specification states that a satisfactory material must not yellow to a yellowing factor of more than 15 in less than 500 hours exposure in the fadeometer.

After samples are exposed in the fadeometer, a recording spectrophotometer is used to calculate the yellowing factor of the samples. This instrument can be used to measure either the per cent of light transmitted or the per cent of light reflected by a sample specimen. When calculating yellowing factor, the per cent of light transmitted is measured. In Fig. 2, we can see typical per cent transmittance

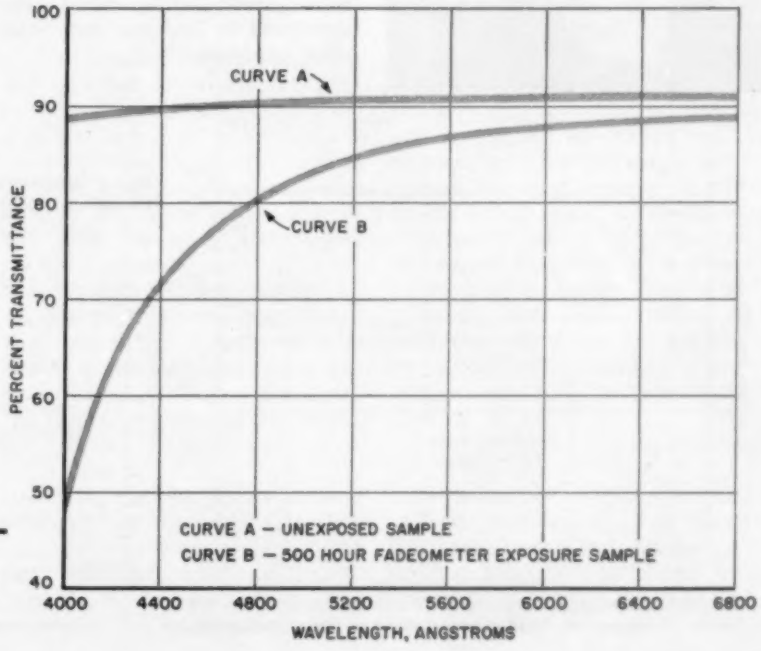


Fig. 2. Typical recording spectrophotometer transmittance curve for a sample of clear unstabilized styrene plastic.

LIGHTING DIFFUSERS STAY WHITE LONGER

curves plotted by a recording spectrophotometer, Fig 3. These curves represent a plot of the per cent of each wave length of light which the sample allows to pass through it.

Curves in Fig 2, were plotted using clear specimens of unstabilized polystyrene. Curve A shows that this material transmits approximately 90 per cent of all visible light radiation which strikes it. After 500 hours exposure in the fadeometer, the same sample is again tested and the transmittance, represented by curve B, drops off considerably in the lower portion of the visible spectrum. This indicates graphically that the sample has yellowed badly.

From these curves the yellowing factor of purpose polystyrene can be calculated and is found to be 28.0. It is obvious that the unstabilized polystyrene does not meet IES-SPI-NEMA specifications.

Figure 4 shows the transmittance curves of Styron Verelite after zero and 500 hours exposure in the Fadeometer. In this case it can be seen that the transmittance characteristics of the sample have changed very little after the 500 hours exposure. In other words, the sample has yellowed very little. Calculating the yellowing factor from the values obtained in curves A and B, Fig. 4, we find 1.1. This is well below the specification of 15.

An accelerated test must predict in a short time how a material will perform under actual long term exposure conditions. A comparison of Fadeometer data and long term actual exposure data shows good correlation, Fig. 5.

Samples of Verelite have been exposed to standard cool white 40 watt fluorescent lamps at distances of ½, 1, 1½, and 3 in. from the tube. After three years exposure, the sample ½ in. from the tube had yellowed to a factor of 4.5.

Under Fadeometer exposure it took 915 hours to yellow to this same factor of 4.5. Dividing 915 hours into three equal increments gives us points at 305 and 610 hours. These points should then correspond to one and two years actual exposure.

After one year exposure, the yellowing factor of Verelite was 0.9. This point agrees closely with the 305 hour value of 0.7. After two years exposure, the yellowing factor was 1.4. This also agrees closely with the 610 hour value of 1.5.

The yellowing factor after three years and three months actual exposure was measured and found to be 5.5. This value also correlates well with the Fadeometer exposure data and shows that Styron Verelite, after this amount of exposure, begins to yellow at an accelerated rate. Actual exposure data for distances greater than ½ in. are still in the straight line portion of the curve. Hence, it is impossible to determine if any correlation exists at this time.

Because of the excellent correlation of the ½ in. actual exposure data to the Fadeometer data, it can be concluded that this is a good device for predicting the resistance of polystyrene to yellowing under actual cool white fluorescent tube exposure.

Actual exposure data quoted represent 24 hour continuous exposure. Three year exposure data, then, is equivalent to 26,280 hours. Based on the industry average of 60 hours use per week, this represents eight years of actual use life.

Since this data is for the critical exposure of ½ in. from the tube, it can be concluded that Styron Verelite can be expected to perform satisfactorily for at least 10 years in a properly designed lighting fixture having greater distance between the tube and the enclosing plastic diffuser. **End**

Fig. 3. Spectrophotometer measures changes in color of samples after exposure to both artificial and natural light.

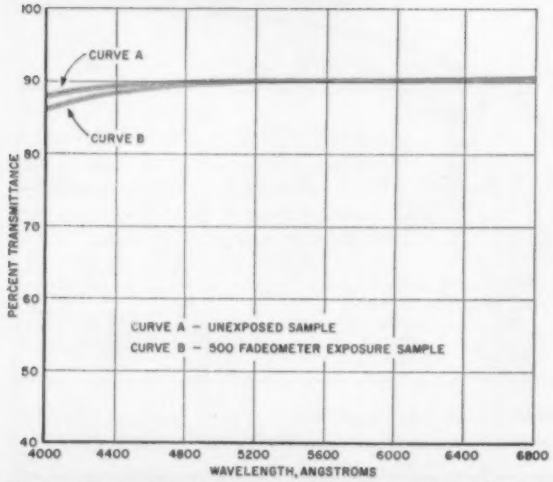
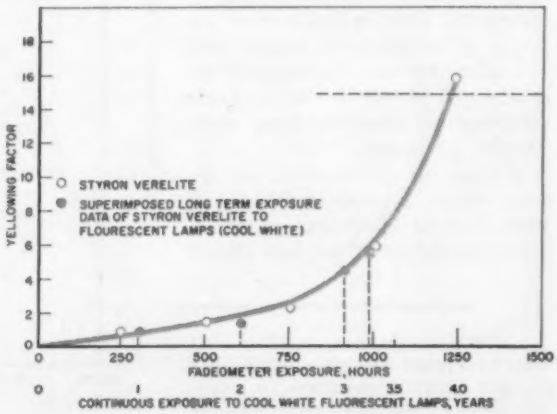


Fig. 4. Transmittance curves of Verelite sample after 500 hours exposure in Fadeometer shows little yellowing.

Fig. 5. Comparison of artificial data and long term actual exposure data shows good correlation, proving test procedure.



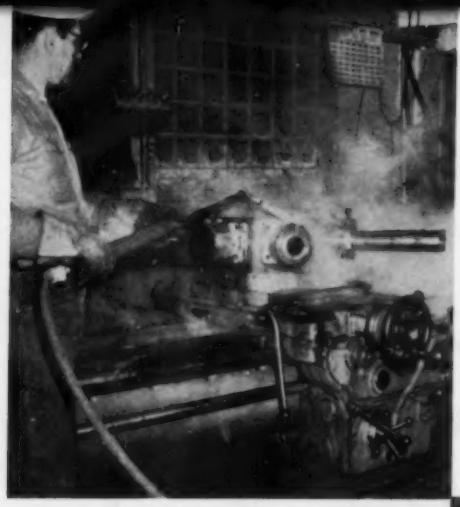


Fig. 1. Operator cleans turret lathe with low pressure steam and detergent.

Low pressure steam with detergent—

NEW STYLE STEAM CLEANING

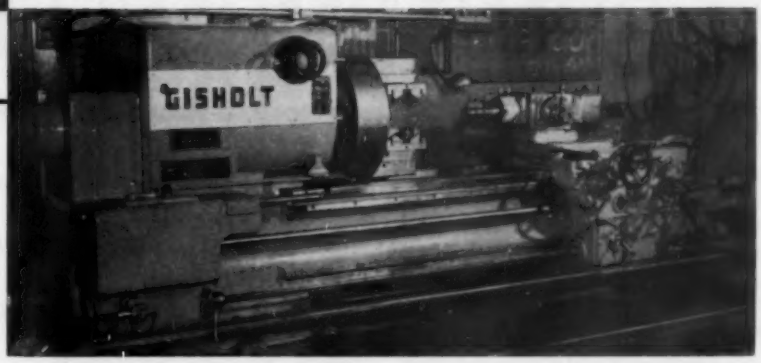


Fig. 2. Lathe was cleaned thoroughly and returned to production in 45 min.

JUST AS PRODUCTION machinery and methods have been improved, so have steam cleaning processes and equipment. One of the latest developments is a machinery appearance-reconditioning process which combines efficient steam cleaning with protection against rust, and improves the appearance of equipment being cleaned. The process was developed by Homestead Valve Manufacturing Company for the automotive market to appearance-recondition car and truck motors. It is now being used for cleaning floors, production and other types of equipment.

The process employs relatively low pressures and relies upon an improved detergent to loosen dirt and grease deposits. The detergent, though harmless to paint as well as aluminum or magnesium surfaces, literally dissolves grease and dirt. With the deposits loosened, the impingement of the vapor spray then quickly washes dirt accumulations away. The result is thorough cleaning without excessive vapor or water. And, because low pressure is used, the chance of dirt and foreign matter being forced into bearings of control mechanism of production machinery is minimized.

The second step in the appearance-reconditioning process protects against flash-rusting of bare metal, and renews the appearance of the machinery being cleaned. While the clean surfaces are still warm and wet from steam cleaning, a wax-like emulsion is sprayed over the entire machine. This material, called Jenny Gloss, absorbs moisture, and because the metal surfaces are warm, begins to dry at once. As the emulsion dries, a hard protective coating is formed which seals out air, and protects against rusting. It provides an excellent bond for paint if "touching-up" is necessary or desired.

In addition to steam-cleaning units that burn fuel oil (usually portable) or units that burn gas (usually stationary) there is a recently developed unit which is electrically heated and powered. This model is portable and operates on 220 or 440 volts, 60-cycle, three-phase electrical current.

A recent timed test showed that the new machinery cleaning process and electrically powered steam cleaner is practical and economical for cleaning production machinery and equipment during normal working hours. A 28½-in. swing, turret lathe, used 16 hr daily, was chosen for the test. The lathe, used primarily for finishing semi-steel castings, was considerably dirtier than most production machinery.

At 9 a.m. the steam cleaner was connected to an electrical outlet and water supply. One and one-half minutes later cleaning was started. Working from the ends of the machine toward the center, the operator first cleaned the front, then the rear of the lathe. The water from the vapor spray collected in the coolant pan.

At 9:24 a.m. the cleaning had been completed, and the operator made one more "pass" over the lathe to wet all surfaces. The steam cleaner was then turned off, and the operator applied the wax-like emulsion over the lathe's entire surface. A self-contained pressure sprayer was used to apply the protective coating. As the coating dried, a vacuum pickup was used to drain the coolant pan and sump. Metal chips were then removed from the pan, and fresh coolant added. At 9:45 a.m. the lathe was back in operation. Only 45 minutes of production time was lost during the cleaning.

More important was the fact that production workers within 10 ft of the lathe performed their operations without interruption. The turret lathe was thoroughly clean and free of rust and its appearance was practically that of a new piece of equipment. **End**

What To Consider Before Selecting PUMP IMPELLERS

By HENRY M. POLLAK, Development Engineer, Commercial Pump Dept., Ingersoll-Rand Co., Phillipsburg, N. J.

CENTRIFUGAL PUMP applications are so widespread that it is rare that a plant engineer does not have at least one or two centrifugal pumps doing some sort of liquid moving job. Why do centrifugal pumps have such wide acceptance? They embody the most desirable characteristics of any machine; simplicity, few moving parts, long life, ease of maintenance, minimum repair, low cost. Centrifugal pumps save money.

Yet, unless proper care is taken to match the right pump to the specific conditions, more money can be wasted than is saved.

The impeller of the pump must be matched to the specific set of conditions in your plant for best service and lowest pumping costs. Mechanically the following items are involved in selecting the right impeller: 1. Type (open or closed) and (2) Shape and size.

There are three operating conditions that influence the selection: 1. Liquid to be pumped (its viscosity, specific gravity, and vapor pressure). 2. Entrained material (solids or gases). 3. Characteristics of the system (available suction head, discharge head and the desired flow rate).

Only the mechanical aspects need be considered when the operating conditions that influence selection have been predetermined.

In the closed impeller, the head is generated between two confined walls rotating with the shaft. In the open impeller, it is generated between one wall rotating with the impeller and one stationary wall, usually the casing. See Fig. 1.

The closed impeller should be preferred in the great majority of applications. See Fig. 2. A closed impeller requires little maintenance or service during its life. Wearing surfaces are less problematical than those of an open impeller and with nominal maintenance it retains its original efficiency over a greater portion of its total life. Although the closed impeller is a more expensive impeller, savings in the over-all pump cost can more than compensate for this. Running fits and tolerances increase with use, but efficiencies do not drop off as fast as with the open impeller.

Open impellers are designed primarily to handle liquids with entrained solids, especially if these solids have a pronounced clogging tendency. Such items as paper stock and sewage that will quickly clog a closed impeller can often be handled readily with an open impeller.

If for some reason any entrained solids do become wedged against the impeller vanes, an open impeller lends itself to cleaning more readily than a closed impeller.

The efficiency of an open impeller, however, is dependent upon maintaining a close clearance between the unshrouded side of the vane and the stationary wall that forms the other side of the head generating passage. Any increased clearance results in large leakage losses and hence lower pump efficiency.

In addition, since the clearance must be maintained in areas at and

Table I. Data on units with reasonably close head-capacities, different speeds.

Pump Symbol	Pump Speed	Head Capacity @ bep	Max. Impeller Dia. (in.)	Max. Hp req'd	Net Wt.[1]	Max. eff. (per cent)	Approx. Power Input[2] (kw)
A	1750	100-220	11	10	445	65	7.5
B	3450	103-210	5½	7½	265	82	6.0

Note 1. Weight for close-coupled motor pump.
Note 2. When operating at 100 ft, 220 gpm.

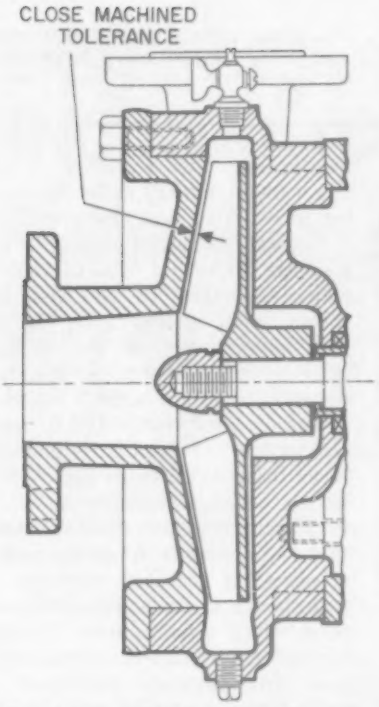


Fig. 1. Open impeller. Bad clearance at vanes drops operating efficiency.

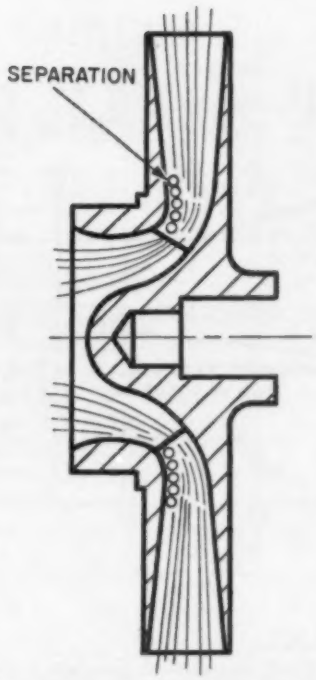


Fig. 2. A closed impeller. Separation can lessen the vapor binding chances.

near the periphery of the wheel, erosion and wear is accelerated because of high surface speeds. On the other hand, leakage in closed impellers is controlled closer to the impeller hub.

This relatively rapid loss of efficiency can be overcome by providing the open impeller with some method of axial adjustment. Open impeller pumps must be checked and careful adjustments made to keep them operating at peak efficiency.

An open impeller is not the only solution to preventing clogging when pumping solids. Fewer vanes in the impeller reduce the chances of clogging by increasing the size of the minimum opening. In some very special cases the number of vanes is reduced all the way down to two. This solution is available to both open and closed impellers.

Some mention should be made of the problem concerning selection of impeller size. For any given system, impeller size depends on speed. Therefore, the problem resolves itself into "What speed do I want?"

With a motor drive, it is nearly always wise to select the highest synchronous speed available—3600 rpm, 1800 rpm, etc., for 60-cycle current. The advantages of higher speed can probably be shown best by a comparison such as shown in the table. The two pumps represented are designed to cover approximately the same range of head and capacity.

The problem cannot be generalized when the pump is driven with a turbine. Both higher speeds and larger speed ranges are available with this type drive, and the answer usually depends upon mechanical limitations of the equipment being selected. It also might be necessary to go to a slower speed where noise level is an acute problem or where very special suction conditions exist.

Many solutions have been proposed for pumping liquids with entrained gases; none of these have been a cure-all.

One method for obtaining higher efficiencies when pumping mixtures of gases and liquids involves taking advantage of "separation." Separation is the phenomenon of the flowing liquid leaving the wall that confines it. This can occur at sharp bends, sharp projections in the flow, etc. See Fig. 2.

When separation takes place a low pressure region is formed at the point of separation. By purposely causing separation in an impeller this low pressure region can be utilized for drawing vapors and gases into the impeller and lessening the chances of vapor binding.

When analyzing a system for the purpose of pump selection, it is usually helpful to determine what is known as the system curve.

At times, however, it may be difficult to determine the exact operating conditions that the system will impose on a pump. For example, this problem might exist when a pump is to be switched from one piping system to another by valving. Suction and discharge conditions and even the characteristics of the fluid can be changed as the pump is switched back and forth.

More commonly, a series of conditions exist on a single system as valves in the system are opened and closed. An example of this is shown in Fig. 3. Under these conditions desired flexibility can often be obtained by selecting a pump with a non-overloading impeller.

Figure 4 shows a head-capacity curve of a non-overloading pump compared to a standard pump curve. The important point to note is that on the bhp curve A, the brake horsepower reaches a maximum and does not increase with increased capacity—it is non-overloading.

On the bhp curve B, the brake horsepower bhp increases continu-

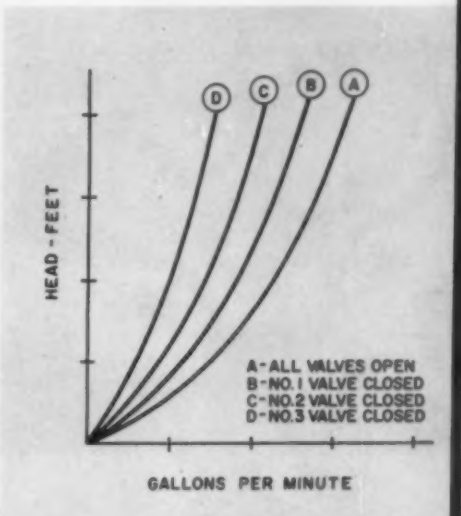


Fig. 3. Example of what can happen to system pump when valves are operated.

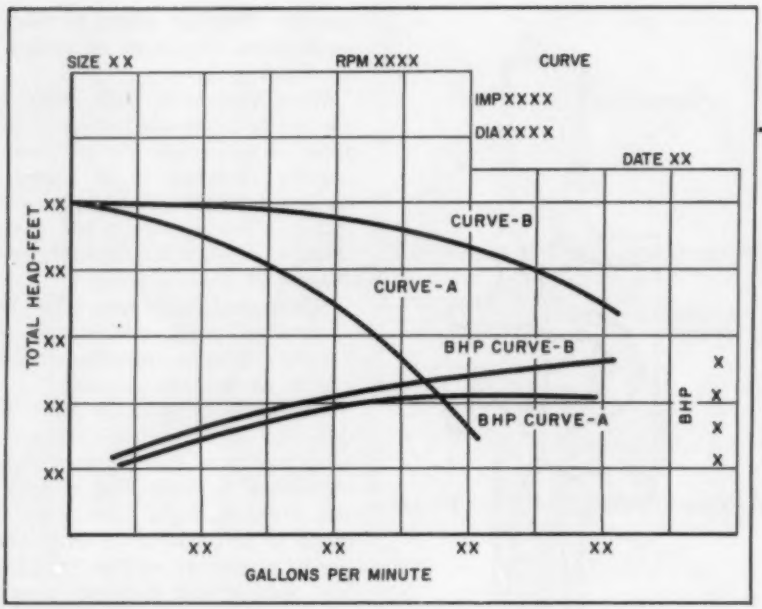


Fig. 4. Bhp curve A pertaining to non-overloading impeller pump levels out; bhp curve B in contrast keeps rising.

SELECTING PUMP IMPELLERS

ously to the maximum capacity of the pump. An impeller can often be made for an existing pump that will produce a non-overloading curve by using fewer vanes, a smaller angle of outlet of the individual impeller vane, and a smaller discharge width of the impeller.

Any pump with any impeller can be made non-overloading by simply choosing a motor whose horsepower is equal or greater than the maximum horsepower required by the pump. In this case, however, the motor horsepower picked is usually far more than is necessary to operate the pump at any condition on the head capacity curve except the very end. This is an expensive way to get a non-overloading pump. It is better to specify a pump with a non-overloading impeller.

Often, it is difficult to accurately predict the necessary system curve for the pump selection. Under these conditions, it is not uncommon to estimate the head losses of a system and add a "safety factor" by requiring more head than is necessary. With a pump that is not non-overloading, this so-called safety factor might actually cause the motor to overload and "burn-out."

Suppose the actual conditions of a system imposed a head of 185 ft with a flow rate of 260 gpm as shown on the system curve, Fig. 5. The requirements of the system might be only 170 gpm and in order to insure a "safety factor," suppose it was specified that a 200-ft head was required. This point is marked X on the H-Q curve in Fig. 5. Selection could conceivably be a 7-in. impeller (well within the limits of a 15-hp motor). When the pump is placed in the line, however, it will operate at the 185-ft, 260-gpm point which requires over 15 bhp (unless the system is throttled by some other means). This error is particularly dangerous when using explosion-proof and totally-enclosed drivers, as there is no safety factor available in the motor.

If you specified a non-overloading type impeller with the pump, no harm would be done with the identical mistake. The 200 ft, 170 gpm conditions on the curve in Fig. 6 would lead to the selection of a 7¼-in. impeller and a 15-hp motor. In this case, the rating of the driver would never be exceeded no matter what the actual conditions turned out to be. **End**

Fig. 5. At selection point X a 15-hp pump motor is within limits of needs; but in operation over 15 bhp would be required.

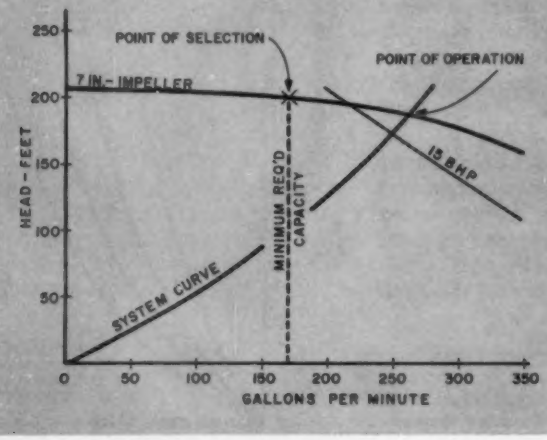
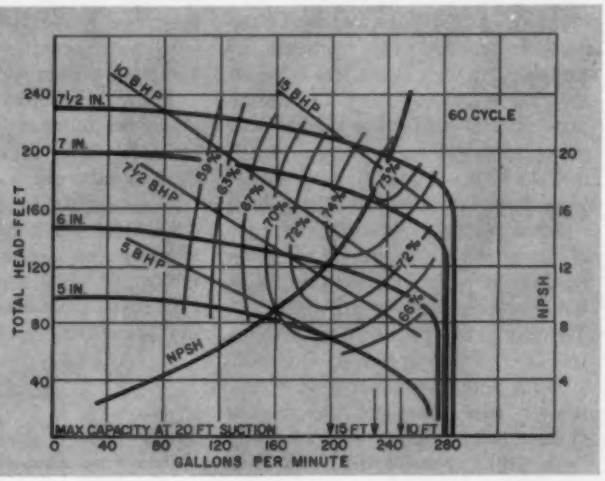


Fig. 6. In comparison, non-overloading 7¼-in. impeller would handle the 200-ft, 170-gpm conditions with a 15-hp motor.



Damp Material, Trash, Filter Cake . . .

INCINERATOR TAKES 'EM ALL

By E. P. STREET, Proj. Eng., Plant Engineering; G. FOZO, Proj. Eng., Design Engineering; and M. H. COPLEY, Chief Operating Eng., Merck, Sharp & Dohme, Div. of Merck & Co., Inc.

INCINERATION is generally accepted as the preferred method for disposal of combustible solid waste materials. This is particularly true with respect to wastes of the type generated by modern pharmaceutical and biological production and research operations, because of the nature of much of the waste material.

Conventional incineration has certain drawbacks, however. These, are generally known, and include the problem of smoke and/or odors which may be produced by incineration, the necessity for manual handling of wastes for loading and stoking the furnace, further manual handling to remove ashes together with dust and odors from the smoldering ashes, and the maintenance of furnace structure subjected to extreme operating conditions.

MS&D's new incinerator was constructed in 1959, and replaces two smaller incinerators, built eight and ten years ago. Under present conditions, waste generated by operations at the West Point, Pa., plant amounts to 18,000-20,000 lb per day, equivalent to about 40 cu yd.

Wastes contain some 30 per cent of dry trash, such as paper, and the rest consists of such more or less damp material as animal cage cleanings, unsalable merchandise, and sewage sludge filter cake. This latter is fed to the incinerator from an adjacent vacuum filter which discharges a cake containing approximately 30-35 per cent solids from thickened raw sludge averaging 95 per cent water. Other than this, all wastes reach the incinerator building by truck. Depending upon their nature, they may be contained in plastic bags, standard type of galvanized cans, drop-side paper trucks, or corrugated packers.

In order to eliminate or minimize manual handling three major pieces of mechanical equipment have been provided: 1. an apron conveyor for charging the furnace. 2. a mechanical stoker for moving wastes through the furnace, and 3. ash dollies and a hoist for cleaning the ash hopper. At the loading point the conveyor is located in a shallow pit so that its surface is several inches below the floor level. See Fig. 1. The waste material is pushed or dumped by the operators on the conveyor; sludge filter cake falls on the conveyor just after it passes the loading point. See Fig. 2. The conveyor carries the refuse to a point above the furnace, and the incinerator is charged by opening an air-operated sliding gate.

Both the gate and conveyor are manually controlled by the operator from the loading floor, so that the rate of feed can be regulated to

Fig. 1. Running the conveyor below floor level at loading area minimizes lifting.

approximate the speed of burning. This can change greatly because of the varied composition of the wastes being burned. Actually, little or no allowance for the predominant characteristics of the wastes is made at the conveyor loading point, as it is easier and more effective to compensate for the differences by regulating furnace conditions.

Furnace temperature is somewhat dependent upon the charge. Obviously, a charge containing mostly paper, corrugated board, and sawdust will burn more easily and produce a hotter fire than one consisting largely of sludge cake and damp animal cage cleanings. An oil burner located in the side of the furnace operates continuously to hold a temperature of about 2000 F. With this constant or nearly-constant heat input, it becomes a relatively simple task to regulate the charging of the furnace so as to avoid extremes of temperature variation. The operator is guided by a recording instrument which shows the furnace temperature.

Burning can also be controlled by the frequency of operation of the stoking grates. These are equipped with a timer for automatic operation but they are usually operated manually, as it has been found that the varying characteristics of the charge demand different handling on the grates. The operators' experience is relied upon to determine the proper amount of mechanical stoking, so that complete burning can be achieved.

Ashes, which collect on the dumping grates at the end of the stoker, are dropped into the ash pit by manipulation of the hydraulically operated grates. The ashes are wetted down by water sprays, so that there is no smoldering or dust formation. Ash unloading is largely mechanized; the operator opens a sliding door in the bottom of the ash hopper, and ashes fall into a container mounted on a dolly. See Fig. 3.

All gases leaving the furnace pass through a combustion chamber in which is located a second supplemental oil burner. This burner operates automatically to maintain a temperature of 1800 F in the combustion chamber. This is sufficient to assure complete oxidation of all carbon and odor producing material in the gas stream.

Because the incinerator flue is connected to the stack which also serves the plant boilerhouse, a secondary chamber containing water sprays is located after the combustion chamber. The sprays are automatically operated whenever the combustion chamber temperature exceeds 1400 F, and serve to reduce the gas temperature to about 900 F.

The over-all thought behind the operation and control aspects of this incineration plant is, then, to provide mechanical equipment under direct operator control wherever material handling problems might occur. Generally, instrument control has been avoided because of the unpredictable nature and quantity of the refuse to be incinerated. Instrument activated controls have, however, been installed on the combustion and secondary chambers, where their action serves as added protection against discharge of smoke or odors.

The incinerator is sized to handle in an 8-hr period the wastes produced in a day of normal operation. The plant operates on a one-shift, five-day week schedule, and the active biological nature of much of the waste material prevents holding it for periods of more than a few hours. **End**

Fig. 2. Filtered sludge cake is dumped on the incinerator charging conveyor.

Fig. 3. Ash containers are loaded in pit.

Fig. 4. Electric hoist does the heavy work of load handling from pit to truck.

HOW TO DESIGN

PNEUMATIC-HYDRAULIC ACTUATION SYSTEMS

NINTH IN A SERIES OF ARTICLES

Part IX. Controlling amount of movement by the use of various pneumatic circuits

IT WOULD BE almost impossible for any one person to conceive all of the various applications that could be performed by pneumatic circuitry. In the past eight articles we have discussed some of the more basic movements in our production processes. In this article we will discuss the control of movements by mechanical, electrical, or pneumatic means.

First, we will discuss a couple of the important components which can provide different degrees of movement. Second, we will discuss the circuits that are employed. One of the most widely used is the adjustable stroke cylinder. Such cylinders are generally either adjustable on the forward stroke or adjustable on the return stroke.

Figure 1 shows a cylinder that has an adjustable forward stroke; Fig. 2 shows the adjustable return stroke.

The cylinder shown in Fig. 1 is used where very accurate positioning is required (normally a standard pneumatic cylinder has a stroke variance of plus or minus 1/32 inch). In many applications the standard cylinder is not accurate enough for positioning a workpiece under a broach, drill spindle or press ram. Also, when various sized workpieces are put through the same machine, the fixed stroke cylinder will require external stops which are not always feasible.

We also find many applications where a considerable amount of force must be used for a certain distance. However, when that distance is traversed, there must be an accurate stop or the workpiece will be crushed. This is another good application for the stroke adjustment cylinder.

The stroke adjustment cylinder also performs well on applications where an air cylinder with a vacuum pick-up head is used to pick up cans, sheets, etc. The stroke can be adjusted so that the vacuum pickup head is not jammed against the article being picked up. This eliminates damage to the head and to the workpiece.

Advantage of the stroke adjustment of a cylinder on the return stroke is that there is a considerable savings in the volume of air consumed. For example, a universal type machine which will accommodate several lengths of workpieces would waste a considerable volume of air on pieces requiring only a very short stroke if a conventional type air cylinder were used. Excessive time would be consumed also. For example, if a 4-in. bore by 12-in. stroke is needed for one application and a 4-in. bore by 1-in. stroke is used on another the 12-in. stroke consumes 0.174 cu ft per cycle while the 1-in. stroke consumes 0.014 cu ft. With the stroke adjustment 0.160 cu ft is saved per revolution.

You will note the difference in design between the

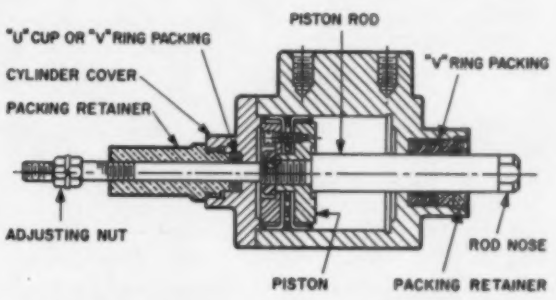


Fig. 1. This cylinder is used where very accurate positioning is required. Standard cylinders, with a stroke variance of plus or minus 1/32 in. are not always sufficiently accurate.

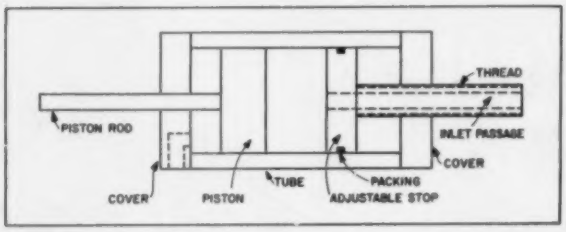


Fig. 2. This cylinder has an adjustable return stroke. Note that while the piston and rod assembly are same as those of a conventional cylinder, adjustment feature is separate.

cylinders shown in Fig. 1 and Fig. 2. The piston and rod assembly in Fig. 2 is the same as a conventional cylinder while the adjustment feature is a separate mechanism. In Fig. 1 the piston, rod and adjustment feature is all one assembly.

Effective area for the forward movement of the piston is reduced by the cross section area of the adjusting mechanism. It is imperative that the thread section not be allowed to make contact with the packing because a leak will occur. It is wise to place a protective shield around the adjustment feature in Fig. 1 in order to protect the operator if he unconsciously puts his hand on the adjustment rod.

Figure 3 shows a circuit in which two adjustable stroke cylinders are used. In this circuit the movement is automatic. The job being done is press-fitting a bushing into work pieces. Both parts are hopper fed. The circuit has solenoid operated valves that can be push-pin operated during the setup in which the adjustments are made on the strokes.

Adjustment must be locked securely so that they will not shake loose due to impact. After the adjustments are set and the pistons are in the retracted position, operator closes switch K which energizes solenoid X shifting spool of valve B and air pressure is directed to blind end of cylinder A. Guide on end of piston rod then moves workpiece to pressing station.

Pressure builds up, closing contacts in pressure switch N. This energizes solenoid Y of valve B and solenoid S of valve D. Air pressure is directed to rod end of cylinder A and blind end of cylinder C. Piston of C advances at a speed set by flow control E, picking up bushing from vibrating hopper and pressing it into workpiece. When piston rod reaches predetermined position, limit switch M is contacted and solenoid R is energized causing air pressure to be directed to rod end of cylinder C and piston retracts.

Roller on limit switch L is contacted energizing solenoid X and next cycle is started. As the workpiece is moved to the work station the piece already there is advanced to the conveyor.

To stop the cycle, operator releases switch K and, as piston of C retracts, cycle will end. An additional limit switch could be added to the electrical circuit so that when magazine P is emptied, the cycle will stop.

In making a change in the stroke it is well to make the adjustment when the piston is retracted or when the air pressure is shut off. This reduces the amount of force required to turn the adjustment nuts.

Another cylinder often used in pneumatic circuits to accurately control movements is shown in Fig. 4. Here we have a double cylinder in which one section will be used for controlling movement to a certain point. The second will control the remainder of the travel. As pointed out previously it is almost impossible to accurately stop an air cylinder in midstroke due to compressibility of the air.

In Fig. 4 the piston rod on one end is anchored, allowing the body to move, but the piston rod on the other end is free to move. To better illustrate this let us look at Fig. 5. To start the cycle, operator depresses pushbutton PS-1. It can be started by a workpiece moving down a conveyor contacting a limit switch or passing through the beam of an electric eye. The contact of the electrical component momentarily energizes solenoid S-1 of valve A directing air pressure to port 1 of cylinder J and workpiece is moved to drill station. As LS-1 is passed, solenoid S-5 of valve C is energized, directing air pressure to blind end of clamp cylinder L. On the end of rod of cylinder L is a V-shaped jaw which causes workpiece to be centered under drill head as it is clamped.

As LS-2 is contacted and passed, solenoid S-9 of valve E is energized and air pressure is directed to blind end of drill cylinder. The advance speed of the drill cylinder is controlled by the setting of flow control G. At end of drill stroke, limit switch LS-3 is contacted

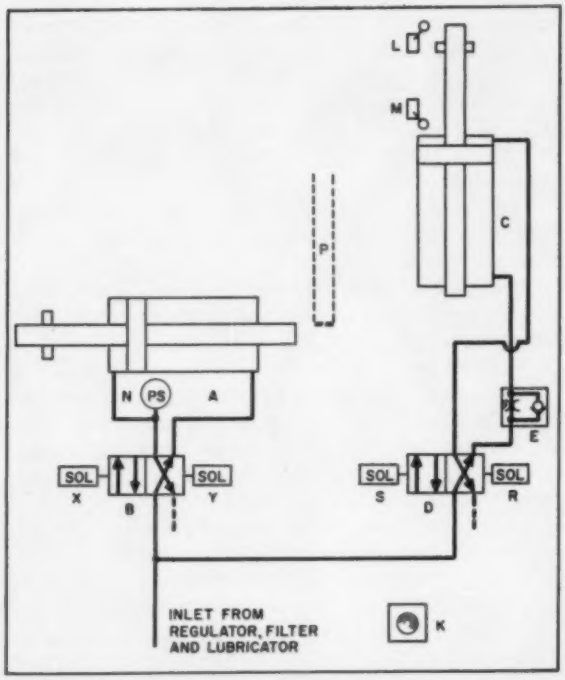


Fig. 3. In this circuit two adjustable stroke cylinders are used. In such a circuit, the movement is entirely automatic.

which energizes S-10 of valve E. Air pressure is directed to rod end of cylinder N and piston rapidly retracts.

As LS-4 is contacted, solenoid S-6 of valve C is energized and air pressure is directed to rod end of L and piston of L retracts freeing the workpiece. LS-5 is contacted and solenoid S-3 of valve B is energized directing air pressure to port 3 of cylinder K. Piston advances workpiece to tap station. LS-6 is contacted energizing solenoid S-7 of valve D and air pressure is directed to blind end of cylinder M. This cylinder is also equipped with a V-shaped jaw for locating the workpiece as it is clamped.

As LS-7 is passed, it energizes S-11 of valve F and air pressure is directed to blind end of tap cylinder P

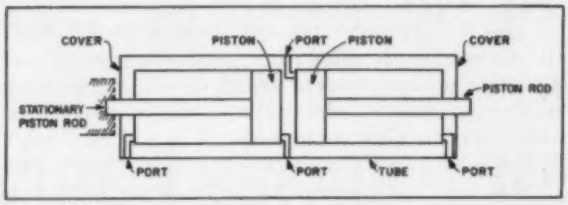


Fig. 4. In this double cylinder one section will be used to accurately control movements to a certain point while the second section will control the remainder of the movement.

and tapping is done at a speed set by flow control H. As tapping is completed LS-8 is contacted and solenoid S-12 of F is energized directing air pressure to rod end of P. Piston retracts at a speed set by flow control Y.

As LS-9 is contacted S-8 of valve D is energized and piston of M retracts. Finally, LS-10 is contacted and solenoids S-2 and S-4 are energized and air pressure is directed to port 2 of J and port 4 of K returning their pistons to original position and the next cycle is now ready. The workpiece from the first cycle will be ejected on the second cycle as the workpiece is pushed into the tap station.

Sequence Valves Work, Too

It would be possible to eliminate some of the limit switches and two of the four-way controls by using sequence valves. However, if there is much of a pressure line drop or fluctuation in the plant one is bound to experience trouble with sequence valves.

We often find applications where it is desirable to index a workpiece through a certain number of degrees in order to advance it to another station so that work can be performed upon it. One station may be a loading station, another a drilling station, another a tapping station and still another an unloading station. The device for performing the index is called an index table and is usually built with a fixed number of stations such as 4, 8, 12, or 24. The number of stations depends largely upon the diameter of the table. The indexing mechanism may be driven by an air motor, an electrical motor, or an hydraulic motor and is interlocked with the remainder of the circuit.

In order to perform precise operations on an index table the table must be indexed to an accurate stop. These stops may be controlled by shot pins or other locking devices. One of the important things is that the table motion should accelerate and decelerate smoothly, otherwise, workpieces which are not clamped may be thrown out of position. In some instances it may be necessary for the index table to be able to accept a considerable downward pressure especially if one of the stations is doing a forcing or pressing operation. Unless considerable thought is given to the operations it is easy to choose an index table that is not suitable to do the job. Too often one hears the statement that an index table has been used but that it would not perform properly after a short time. The user probably didn't give much thought to his selection.

In Fig. 6 we have a circuit showing the use of an index table. Here, due to the nature of the work, a pilot-operated circuit is used instead of a solenoid-operated circuit. The index table in this example is of the four-station variety: load, drill, ream and eject (or unload). Operator loads at station 1, and piece advances to drill station 2. As it approaches this station, cam momentarily contacts roller DD of two-way valve D directing air pressure to timer chambers EE and FF of valves E and F respectively. The spools of these valves are shifted causing air pressure to flow to the top side of J and K respectively. At same time, lock on index drops into place and plunger CA of valve C is actuated. Air pressure is thus directed to pilot connection BB of valve B, spool is shifted blocking pressure to air motor, and table dwells.

Pistons of J and K advance at speeds set by flow controls M and L thus performing the drilling and reaming operations. At the bottom of reamer stroke the cam on cylinder K contacts roller NN of two-way valve N. Thus, air pressure is directed to pilot connection CC of valve C and valve is reset. As timers EE and FF time out, the spools in E and F shift to original position and air pressure is directed to pilot connection BA of valve B, spool shifts and air flows to air motor. Table then indexes to next position.

The reason for using both G and H is that both cylinders must be fully retracted before the table can start to index. This is a precautionary measure that eliminates the possibility of one cylinder being in the

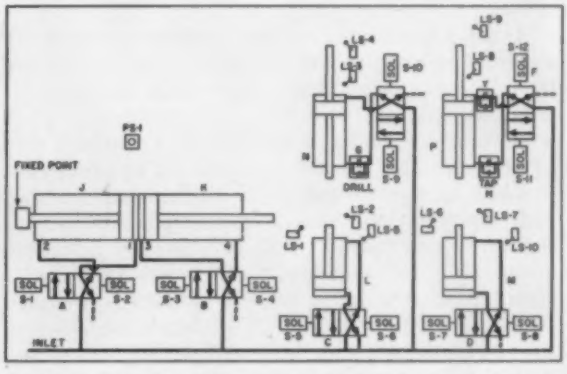


Fig. 5. This is a circuit employing the double cylinder shown in Fig. 4. Jobs performed centering, clamping, and drilling.

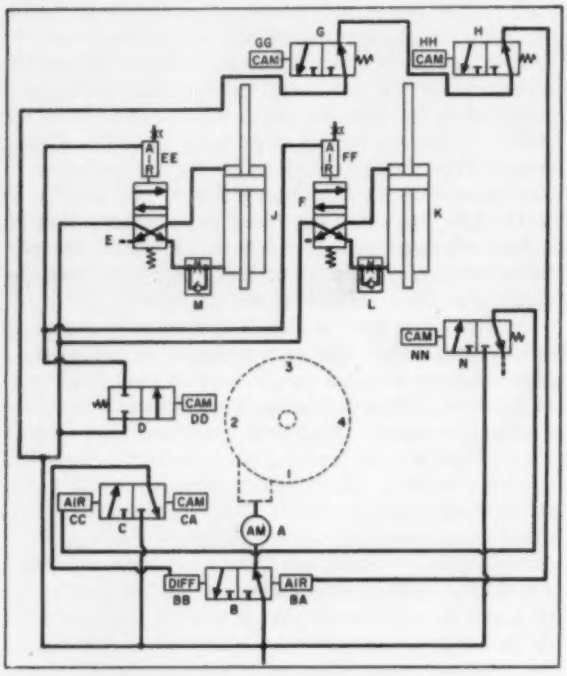


Fig. 6. This circuit is pilot-operated instead of being solenoid-operated, due to the nature of the work. The index table has four stations: load, drill, ream, eject (or unload).

extended position when rotation of the table commences. This could cause serious damage.

It would be possible to eliminate either valve E or F but both were used in this instance because the drilling operation required a considerably longer period. Thus, the timing chamber needed a longer holding period for the drill cylinder. Cylinders J and K are both of the stroke adjustment type as the hole being drilled and reamed is a blind one and the depth must be accurately controlled.

At the eject station the piece is mechanically ejected by a pick-off mechanism. The piece, however, could be ejected pneumatically by the use of an air blast from a two-way, normally-closed valve interlocked in the circuit.

If the requirements of the installations called for complete automation the operator could be replaced by a hopper-feeding mechanism which would be located at station 1. With this arrangement one person could tend several such machines. He would only need to be certain that the hoppers were full of workpieces.

There are applications where it is necessary to gradually dump or pour a batch of material. Furthermore, it may be necessary to make several stops before the container is unloaded. In Fig. 7 we make use of a rotary actuator to do the job. The actuator is connected to the hub of the container. The control valve A is of the manually-operated, four-way, three-position type with a spring return to neutral. The inlet is blocked in neutral and cylinder ports are connected to exhaust.

The operator shifts the handle of A and air pressure is directed to air-oil tank B. This forces oil under pressure to normally-closed shutoff valve H. At the same time air pressure is also directed to one connection of shuttle valves F and G. Next, pressure advances to air pilot connects of valves E and H and the passages through E and H. Oil flows through free flow passage of flow control J and from this point on to port 1 of actuator K.

Oil flowing from port 2 is controlled by flow control D. This, in turn, controls the speed of descent of S. At any time the operator releases the handle the descent of S will immediately cease. To raise S, operator shifts handle to the far extreme and air pressure is directed to tank C. Oil under pressure flows to shutoff valve E. Air pressure is also directed to shuttle valves F and G and air pressure flows to shutoff valve E. Air pressure is also directed to shuttle valves F and G and air pressure flows to pilot connections of E and H. Shutoff valves are opened, allowing oil pressure to flow to port 2 of K. S is then returned to original position. By using the control circuit shown in Fig. 7 very accurate positioning is possible, since the controlling is accomplished with oil.

By using an electrical control system the container could be advanced a few degrees, automatically stopped, started again, and again advanced a few degrees. This could be continued until the container was completely emptied. A number of variations to this could be worked out.

In the next installment we will discuss movements of both the work and the tool. **End, Part IX**

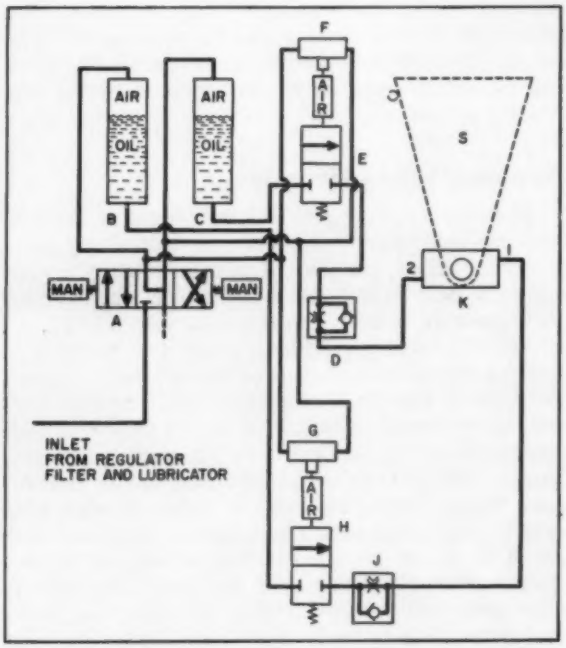


Fig. 7. The rotary actuator shown in this example can be used when it is necessary to gradually dump or pour a batch.

Los Angeles chapter delegate W. E. Fore presides at the officers' inaugural dinner attended by 42 members and guests.

AIPE INSTALLS NEW OFFICERS

ON JUNE 15, in Santa Monica, California, the American Institute of Plant Engineers officially received its officers for the 1960-61 year.

Fred C. Fryberger, Plant Engineer, Food Machinery and Chemical Corp., Baltimore, Maryland, accepted the Institute's highest office from retiring president William C. Wallin, Plant Engineering Department, Western Electric Company, Winston-Salem, North Carolina.

"Taking over" with Mr. Fryberger were: vice president Gerald Austin, Gulf Atlantic Warehouse Co., Houston, Texas; secretary J. N. Jacques, Lakeside Laboratories, Inc., Milwaukee, Wis.; and treasurer L. J. Monty, Artisan Metal Products Co., Waltham, Mass.

Although all were not present at the banquet, the vice presidents of the nine regions of the Institute were officially inducted into office with the national officers.

In recognition of his service to the Institute during his term of office as president, Bill Wallin was presented with an inscribed gavel by PLANT ENGINEERING magazine. In making the presentation, Construction Editor Andy Anderson cited the great interest of the magazine in AIPE, as exemplified in this annual presentation. **End**

New officers (l to r) are: Leo Monty, Gerald Austin, Joe Jacques, Fred Fryberger.

Retiring president Wallin, right, accepts gavel presented by Andy Anderson.

PUNCHED-CARD ORDER SYSTEM

Speeds Deliveries for Colgate-Palmolive

Fig. 1. Below: Cartons accumulate at assembly area of punched-card automatic warehouse. The system handles packages at rate of 50 per minute. Operator, arrow, starts selection of next order by inserting cards in the reader.

AUTOMATIC WAREHOUSING techniques and equipment reached new highs with the inauguration of operations at the Kansas City distribution center of Colgate-Palmolive Co. With this new punched-card automatic installation the company fills order for customers from Chicago to Texas. It makes possible not only greater speed in filling orders but also permits greater accuracy. Fringe benefits include closer control of inventory, safer handling and considerable cost savings.

In the beginning, items were classified according to demand. This classification resulted in a 3-part system; the 72 most active items are selected by the main automatic picking system. Slower-moving items, 130 of them, are picked manually from live storage racks; 35 very slow items are stored on shelves.

Manual and automatic picking procedures are coordinated as follows: Operator (arrow, Fig. 1) receives punched cards for automatic items, printed orders for hand-picked items, along with the number of the assigned truck dock.

He then selects a tote box coded for the designated truck dock and places it on the "right" or "left" conveyor as indicated by a signal light. Then he puts the punched cards in the reader and places the hand-picked items on the conveyor behind the lead tote box. From that point on the procedure is automatic. Cartons are stenciled with the customer's name and address as they proceed toward the truck dock.

Designed and built by Alvey-Ferguson Co., the order picking system consists of live storage racks and conveyors. It is equipped with a director and control system designed by General Electric. The control automatically reads, sorts and memorizes orders at the rate of 100 cards per minute. It scans an average order (16 or 17 cards) in about 10 seconds. Cartons are picked from the racks at the rate of 50 per minute or even faster. Total dispatching time is about one minute for the average order. Current demands call for picking an average of 9000 cartons per day.

A set of punched cards is prepared for each order. This represents the part of the order that is picked automatically. Each card

may call for from 1 to 99 cases of a particular product. A maximum order would consist of 72 cards, each representing a different product. An "end-of-order" card is placed at the bottom of each deck.

Cards need not be sorted and can be placed in the card reader in any sequence. Their information is momentarily stored in a memory circuit and is then discharged in the proper sequence. This directs the automatic picking system to discharge its cartons in a pre-established sequence which avoids pile-ups and traffic jams. From the time the cards are placed in the card reader, operation is automatic.

By means of a set of test cards the equipment can test its own electrical system, an important maintenance feature.

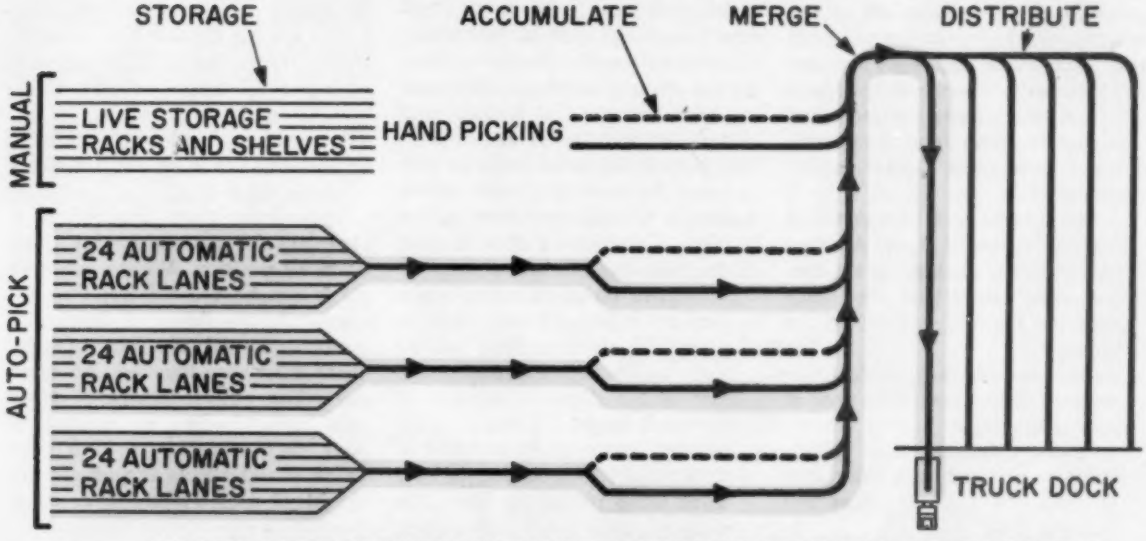
Heart of the system is a giant live storage rack, Fig. 2, that holds the 72 most active items. Gravity conveyor lines are arranged in 3 decks of 24 lanes each. Cartons are automatically discharged onto one of three moving conveyor belts that traverse the face of the rack at the three different levels. At the end of the three belts are deflectors which are set either "right" or "left." Thus each belt empties alternately into one of two conveyor lanes to accumulate an order. This permits picking a second order while the first is being processed.

All conveyor lanes merge into a single-lane conveyor which then distributes orders to one of six branch-line conveyors leading to the truck dock. The coded tote box automatically directs the deflectors. At the truck-dock end, telescoping wheel conveyor sections facilitate truck loading. See Fig. 3.

The system, highly flexible, handles a wide variety of carton sizes ranging from 5 in. by 7 in. by 6 in. to 18 in. by 18 in. by 8 in. Normal changes in package sizes can be accommodated without modifying any of the handling equipment. **End.**

Fig. 2. This is a view along one bank of 24 automatic rack lanes. There are three such lanes. Designed for flexibility, the system can handle a variety of carton sizes.

Fig. 3. This schematic diagram of automatic order picking shows how the automatic and the storage racks and shelves work together to deliver complete orders.



SHIPPING DOCKS / THEIR DESIGN THEIR LOCATION THEIR ACCESSORIES

By A. T. GAUDREAU, Consultant, Gaudreau Associates, Weston, Conn.

THE AREA where materials or goods are unloaded from inbound carriers or into outbound ones at a plant or warehouse is the dock. Whether some are used for receiving only and others exclusively for shipping, they are all used for handling shipments for freight transported by road or rail.

In addition to design of the docks themselves, various accessories such as dock boards, ramps and bridge plates are frequently used to overcome problems posed by height differentials etc., between the shipping docks and bed levels of truck, trailers, etc. This article discusses types of docks and their accessories.

Truck Shipping Docks

MOST TRUCK shipping docks are laid out so that the vehicles back in at right angles to the edge of the platform. In some instances when trucks must be loaded and unloaded through side doors or along their sides, such as flat-top road trucks or beverage city-delivery trucks, the vehicles are serviced from ground level. Types of truck docks include:

1. Portable ramp and platform combinations for ground-level carrier loading and unloading where permanent docks are not available.
2. Adjustable dock bridges which may be extended from the face of a building, such as into a narrow alley, and folded back flush with the building wall when not in use.
3. Elevated runway docks constructed in buildings with floor at ground level.
4. Floor extension into outside shipping platform with front edge at least 12 ft away from the building line.
5. Saw-tooth design which reduces depth of truck spotting. (See Fig. 1)
6. End of floor terminating flush with building line.
7. End of floor set back from outside wall to shelter trucks inside the building.

Whether the truck shipping dock is located inside or outside the building, it must conform to a certain layout and specific dimensions in order to provide proper facilities for the efficient loading and unloading of road trucks or trailers, and sometimes both types of carriers. The ground pavement space or area required for backing a truck into a loading or unloading position against the face of a shipping dock consists of the following two segments:

1. **Apron width:** Turning space required in front of truck berth to permit the truck to back into its berth easily as is approaches the face of the dock.
2. **Truck berth:** Additional space between apron width and face of dock required for occupancy by a truck while parked or spotted in assigned position against the dock.

Apron width. The apron space required in front of a truck berth to maneuver a tractor-trailer unit into or out of the truck berth in one movement is measured out from the outermost part of any spotted truck or other possible obstruction in the area of the maneuver. As dock position increases in width, apron space necessary for swinging into dock position decreases as shown below for a tractor-trailer unit of normal (45 ft) over-all length.

Width of Truck Berth	Apron Width Required
10 ft	57 ft
12 ft	49 ft
14 ft	48 ft

Truck berth. Prevalent over-all lengths of tractor-trailer units range from 45 to 65 ft, and vary in accordance with state laws and types of hauling operations. Straight road trucks are all shorter than modern tractor-trailer units. City delivery and pick-up trucks usually range from 21 to 23 ft in over-all length. The maximum width of a road truck or trailer is 8 ft in all but two states where it is 8 ft 6 in.

Experience shows that 12 ft is abundant for the width of a truck berth or position. Widths down to 10 ft can be utilized but they increase the possibility of damage to equipment, and the loss of time spent in spotting the truck into position. The outside height of truck and trailer bodies, as limited by state laws, ranges from 12 ft 6 in. to 14 ft and affects accordingly the height of roof overhangs or canopies which extend over the dock.

Dock length. The principal factor determining dock length is the maximum number of trucks to be spotted

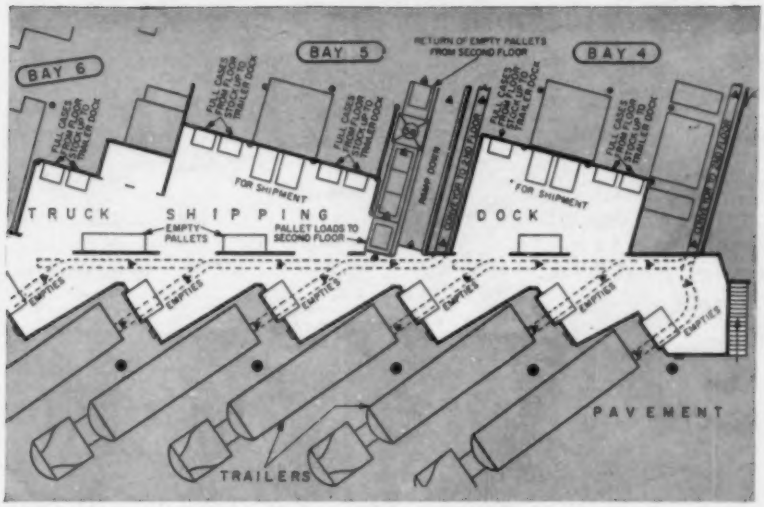


Fig. 1. Series of triangular aprons forms saw-tooth dock at brewing company.

at one time at the dock. Allowing 12 ft across for each truck berth, and multiplying this factor by the number of berths needed, the over-all dock length is readily determined. This length is divided in half when the trucks are to be spotted along two opposite sides of a rectangular-shaped dock.

When there are too few truck berths, the time required for one truck to leave the dock and for another to back into it may seriously encroach upon the time needed for unloading and loading operations. The number of outbound and inbound trucks which are spotted at the same time for unloading and/or loading will frequently determine the maximum number of truck berths needed. The combined space taken up by these berths or slips sets up the basis for determining the dock length.

Determining Dock Height

Dock height. A troublesome problem in determining the proper height for a truck shipping dock is the wide variation existing in the vertical distance from pavement level to truck bed level in various makes and models of road trucks and trailers. This height may range from 42 to 58 in. and thus set up a variation of 16 in. between low beds and high beds. Normally, however, the range for trailers is from 48 to 54 in., with the majority well centered at the 50-in. level. Furthermore, tire size and spring compression will cause the bed height to vary as much as 3 in. in some trucks.

When an appreciable amount of cargo is handled by light, low-bed trucks, such as in the 44-in. category for local pickup and delivery trucks, it may be desirable to provide a separate dock for them. This low level could then be connected by ramps with the higher level used for road trailers. Where trailers of differing bed heights are handled, the practice is to make the shipping dock, if it has enough adjustable dock ramps, 52 in. high. Without such a device, 48 in. is standard.

Dock width. The quantity of cargo to be floored is usually the principal determinant of the width of a truck shipping dock. Ordinarily a 4-ft strip along the building line is ample for floor storage on the dock as this space will readily accommodate a dock-length row of pallet stacks.

A second factor in width determination is the amount of space to provide for the traffic aisle. A 12-ft aisle will permit fork trucks to do right-angle stacking along the aisle, and allow ample space for the passage of two fork trucks going in opposite directions. Finally, space must also be provided for the inclination of adjustable dock ramps without encroaching upon the aisle space.

Rail Shipping Docks

THE CONTROLLING factor in selecting the size of a rail shipping dock is invariably the range of dimensions of the freight cars which are unloaded and loaded at that platform whether is is located outside or inside the building. No fixed standard exists for the over-all length of a car. For example, a hopper car measures 35 ft 10 in. and a flat car 53 ft in length over strikers whereas the average box car is but 41 ft 9 in. in this dimension.

Flat cars, gondolas and hopper cars, however, are usually handled without the use of a shipping dock. This leaves only box cars, refrigerated cars (reefers) and automobile cars requiring shipping dock facilities. These three types of cars are usually considered as being included in the box car category.

Car dimensions. The over-all outside dimensions of box cars, reefers, and automobile cars determine to a large extent the dimensions of the rail shipping dock. Although car dimensions vary, over 80 per cent of present-day box cars fall within 3 or 4 in. of the averages shown in Table 1.

Dock height. The average height of box car floors (except of reefers) above the top of the rails is 3 ft

Table 1. Dimensions of over 80 per cent of box cars fall within those given.

Average Box Car Dimensions	Box Car ft	Box Car in.	Reefer ft	Reefer in.	Auto. Car ft	Auto. Car in.
Over-all outside length over strikers	41	9	41	9	52	3
Over-all outside width	10	8	10	8	10	8
Over-all outside height	14	1	12	6	15	1
Floor height above rail top	3	8	4	1	3	7
Clear width of door	6	0	4	0	15	0
Clear height of door	9	6	7	0	9	11

SHIPPING DOCKS

7.8 in., with plus or minus variations of 3 in. from this average. In practice a dock height of 3 ft 7 in., however, has proved most satisfactory. At docks where reefers are also loaded and unloaded, an increase of 5 in. is necessary above the 3 ft 7 in.-level. Because of this differential, it is sometimes desirable to build one end of the dock at a 4 ft 1 in. platform height for servicing reefers. This higher platform level is then connected by a dockwide ramp to the 3 ft 7 in.-level for box cars and automobile cars.

Calculating Clearances

Span of gap. The minimum clearances of the building and dock edge from the center-line of the track required by the railroads determine the span of gap between the side of the box cars and the edge of the dock as calculated in the table.

Railroad sidings may be inside or outside the building. Inside rail shipping docks are desirable in cold climates but require a larger building than when located outside. The dock itself may be located entirely inside the building, however, and the railroad siding on the outside. In this case, as shown in the table on the next page, the front edge of the shipping dock is at the building line. For this dock location, the minimum span of gap between box car floor and shipping dock is 2 ft 8 in. and has to be bridged over by portable dock ramps.

For rail shipping docks, inside or outside the building, with their front edge located at least 2 ft 4 in. away from the building wall in back of the dock, as also calculated in the table, a 4-in. gap is permissible between box car floor and shipping dock.

This dock provides all minimum clearances from the center-line of the track and requires a flat plate to bridge the gap at each car door.

Dock width. When the rail shipping dock is within the building line, dock width is not important because the work area is more apt to be ample provided the dock is at the same level as the floor. However, the locations of the door openings through the building to the cars may cause trouble unless properly placed as may be perceived from Fig. 2. Where necessary, provision must be made for two-way traffic by powered fork trucks, space taken away by portable dock plates and conveyor sections, and possible temporary storage of pallet loads ready for loading in the cars as also shown in Fig. 2.

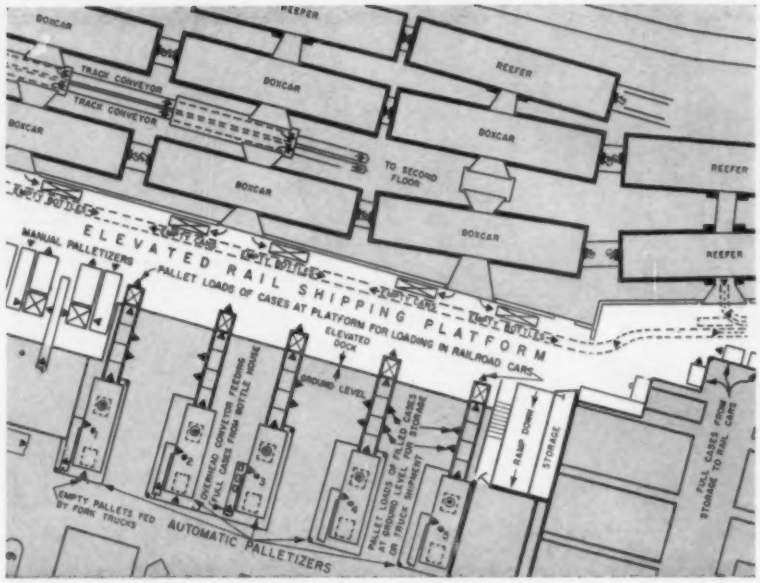

BOXCAR
REEFER
TRACK CONVEYOR
TO SECOND FLOOR
ELEVATED RAIL SHIPPING PLATFORM
MANUAL PALLETIZERS
PALLET LOADS OF CASES AT PLATFORM FOR LOADING IN RAILROAD CARS
ELEVATED DOCK
GROUND LEVEL
OVERHEAD CONVEYOR FEEDING FULL CASES FROM BOTTLE HOUSE
PALLET LOADS OF FILLED CASES GROUND LEVEL FOR STORAGE OR TRUCK SHIPMENT
RAMP DOWN
STORAGE
FULL CASES FROM STORAGE TO RAIL CARS
EMPTY PALLETS FED BY FORK TRUCKS
AUTOMATIC PALLETIZERS

Fig. 2. Rail shipping dock designed to permit loading of cars three tracks deep.

Dock length. The rail shipping dock shown in this figure extends over a distance of 450 ft at a brewery which ships cased beer in palletized loads. The pallet loads are automatically discharged at the elevated rail dock level by the five palletizers located on the ground floor 50 in. below. The loads are immediately picked up by fork trucks operating at dock level and carried into any of the 19 box cars spotted along this platform, 10 of which are shown.

A series of portable bridge ramps links the rail dock to each car spotted on the first track along the building, and also links these cars to cars on corresponding spots on the second and third tracks located farther away from the platform. This linkage provides in effect a floor extension from the warehouse. It constitutes an uninterrupted floor level extending the shipping platform throughout and across all cars, whether they be box cars or reefers. The higher reefer dock level will be noted at the right end of this diagram. This dock level arrangement for reefers, as well as for box cars, permits fork trucks to run in and out of any of the 19 cars spotted along the rail platform.

Shipping Dock Accessories

TO OVERCOME the height differentials between the shipping dock level and the higher and lower bed levels of the trucks, trailers and box cars loaded or unloaded from a shipping dock, a wide variety of portable and permanent ramping devices has been developed. Among the more significant types are:

1. Portable dock boards.
2. Portable board-and-ramp combinations.
3. Permanent dock boards.
4. Portable bridge plates.
5. Dock-mounted adjustable ramps.
6. Built-in mechanical adjustable ramps.
7. Built-in powered adjustable ramps.
8. Truck-leveler ramps and platforms.

Dock boards. Many places are still using perfectly flat quarter-inch,

Span of Gap Between Box Car Floor and Shipping Dock
Based on average clearances for straight track of 4 ft 8½ in.-gage

For Dock with Front Edge at Building Line	ft	in.
Average clearance from center-line of track to building line	8	0
Less: one-half over-all outside width of average box car	5	4
Span of gap between box car floor and shipping dock	2	8

For Dock with Front Edge Minimum of 2 ft 4 in. away from Building Wall	ft	in.
Average clearance from center-line of track to building wall	8	0
Less: minimum width between dock and building	2	4
Minimum clearance from center-line of track to edge of dock	5	8
Less: one-half over-all outside width of average box car	5	4
Span of gap between box car floor and shipping dock	0	4

smooth-surface steel plates for bridging the gap between dock edge and carrier bed.

The dock boards now being supplied in magnesium and aluminum are fast replacing these steel plates. For the same tensile strength as steel, they are about a third lighter in weight. They range up to 10,000 lb in capacity, and up to 250 lb in weight.

Magnesium dock boards may be used singly or in combination with attachable ramps. Two sections used as a combined device provide the extra length needed for steep climbs onto carrier beds. Permanent magnesium dockboards are also available in a form which can be hinged to the dock. They can be set out of the way in an upright position when not in use.

Bridge plates. For bridging the gap between the front edge of a rail shipping dock and a box car spotted at the dock, portable bridge plates are often used. These plates or ramps are usually made of ⅜-in. diamond-tread steel plate. Flared end is equipped with outside channel to receive lock pins. When not in use, they may either be removed by fork truck or left in place. In the latter case the narrow end of the ramp is raised into an upright position by means of an overhead cable passing through a single pulley. This cable is operated by a simple manual winch affixed to a post or door jamb.

Adjustable ramps. These may be dock-mounted or built into the dock itself. Both are available as mechanical or powered units. In the dock-mounted category, the adjustable ramp may be installed in its own framework in front of the dock, or partly recessed into the dock face, or bolted on top of the dock. This category of adjustable ramps is especially adaptable to existing docks and old buildings with inadequate or no outside shipping docks.

Non-Powered Units

Built-in non-powered units may be counter-weighted by a cement block or by a spring assembly. They are usually actuated by a road truck striking a bumper plate while backing against the dock. This bumper is located at the front of the ramp. As it is struck it springs the ramp platform into loading position with its lip falling back on the trailer bed. They cost less than the powered units but are not always as safe to operate because of accidental spring action which can occur when not actuated by a truck.

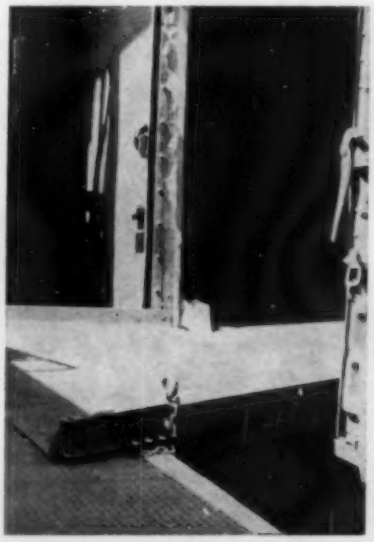


Fig. 3. Portable rail dock bridge ramp.

Built-in powered ramps are available with three sources of power as follows:

1. **Direct air pressure** for light load installations where quick action is desired and the use factor fairly low.
2. **Air-hydraulic** power with either manual or electric pushbutton control.
3. **Hydraulic-electric** power from oil pump hooked up electrically to hydraulic cylinder. Pump may be operated by hand lever or electric motor.

Both hydraulic systems are designed for heavy-duty use where trucks are being loaded or unloaded rapidly on a fairly continuous basis for several hours at a time. Floating ramp action which is inherent in counter-balanced units is optional on most powered adjustable ramps. It permits the ramp to rise and fall automatically with the spring deflection of the road truck.

Truck levelers. A recent development in the field of dock-truck leveling devices is the truck leveler installed on the pavement in front of the dock. This equipment raises or lowers the road truck itself so as to align the truck bed with the dock level. It may be either a ramp or a lift platform. The leveler is more costly than a dock ramp, and its power source is hydraulic-electric. **End**

CORROSION meets its match in Alcoa aluminum conduit

Here's an electrical rigid conduit that you can install and forget.

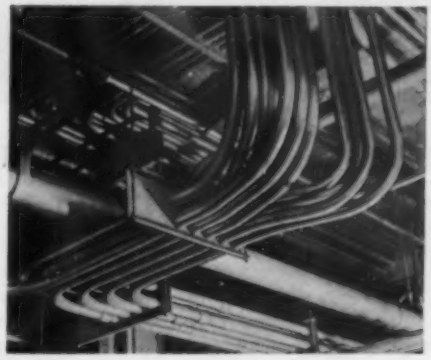
Alcoa aluminum conduit solves most corrosion problems in and around chemical plants.

Aluminum protects itself Unlike other conduits, which require some kind of coating, aluminum forms its own protective film. This film forms naturally in the atmosphere and in the presence of oxidizing agents. Damaged spots are self-repairing—almost instantly! The natural oxide coating on aluminum takes the place of factory coatings on conventional conduits and only under unusual conditions is any other protection required.

Other advantages Corrosion resistance is just one good reason for selecting aluminum conduit. Its light weight (about ⅓ as much as steel) makes it easier to handle and install. Alcoa aluminum conduit is also nonmagnetic and nonsparking.

How about cost? Consider initial cost, savings in installation and maintenance, and service life. You'll see that Alcoa aluminum electrical rigid conduit stacks up as a sound investment.

More information For specifications, or answers to specific questions about the use of aluminum conduit in corrosive environments, contact one of our nearby representatives. Or write to Rome Cable Division of Alcoa, Dept. 5-80, Rome, New York.



NO CORROSION despite moisture, chemicals and vapors in the basement of this sewage disposal plant in Cleveland. Installed in 1932, this Alcoa conduit still looks almost like new.

ROME CABLE
DIVISION OF **ALCOA**

For more facts circle 564 on Reply Card

Tape Control Enters the Nuclear Field—Drills Holes By the Thousands

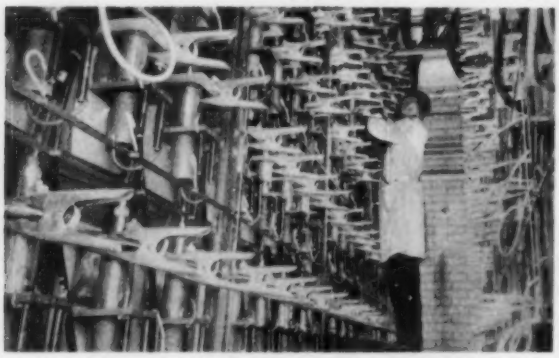
INSTALLATION of tape-controlled machines at General Electric's atomic power equipment plant in San Jose, Calif., marks one of the first applications of automated equipment in the nuclear industry. One tape-controlled machine is now in operation, a second is scheduled to be installed soon, and plans call for six more machines later this year and in 1961.

First machine installed was a turret drill, made by the Burg Tool Manufacturing Co. The automatic tape-control equipment, a Mark II Numerical Position Control, was built by GE's Specialty Control Department, and tapes are programmed by APED's manufacturing engineering section.

On a recent job it ran off 17,200 perfect holes in special plates for an experimental facility in a sixth of the time required to do the same type of job three years ago by manually-controlled drilling. The machine had earlier drilled 27,160 faultless holes in the nuclear fuel tie plates for one of the reactor cores used in the N. S. Savannah, this country's nuclear merchant ship.

According to GE, manufacturing time saved on both jobs on drilling and reaming was a factor of 4 or 5 over previous methods.

Vertical "Field" of Welding Clamps Supports Condenser Banks



A BATTERY OF CLAMPS ties together 300 condensers in a research laboratory program seeking to duplicate the sun's source of energy, atomic fusion. Combined electrical discharge of several banks produces 100 billion watts.

The installation is being used in a research program being jointly conducted by General Dynamics Corporation's General Atomic Div., and the Texas Atomic Energy Research Foundation.

Each condenser-supporting section has been constructed by silver soldering a slotted cylinder to the flange of a formed bracket. Positive clamping of the sections is accompished by the use of welding ground clamps, manufactured by Lincoln Electric Co. The clamps provide a positive low resistance electrical path between the terminals of the condensers when they are not in use.

Fin-Type Heat Exchanger Installed in Exhaust Stack To Cut Fuel Costs

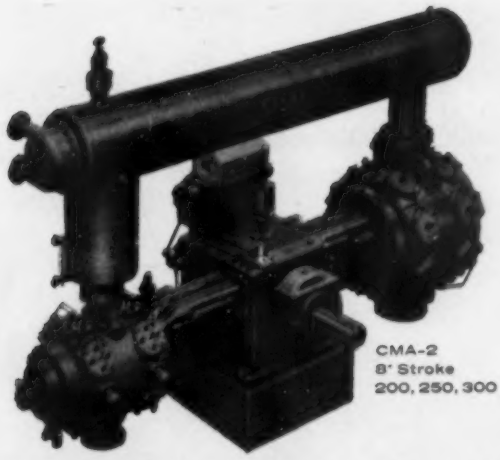
ALMOST TWO MILLION BTU's per hour—that's the saving expected by American Cyanamid Co. at their Bound Brook, N. J. plant, following the installation of a new Fin-Pak heat exchanger.

The heat exchanger, manufactured by Air Preheater Corp., uses the recuperative principle of heat recovery. It is expected to capture and utilize the heat formerly exhausted to atmosphere. As the exhaust gases pass through the unit, metal fins trap the heat and conduct it through a separating wall into the path of incoming air. The fins, with an exposed surface of almost 600 sq ft, extend into the flow passage of cool air to preheat it before it enters the superheater.

The cool air is drawn into the system by a compressor, and after passing through the heat exchanger, is fed into the superheater to support combustion of fuel oil. Since the incoming fresh air arrives in the superheater at a temperature over 700 F, increased by the preheater from 100 F, there is a substantial reduction in fuel requirements.

The exchanger is a compact unit, measuring approximately 10 ft by 5 ft by 3 ft, and weighing only 13,000 lb. It was placed at the base of a 25-ft high stack that will serve the exhaust system. The unit is designed to take 12,000 lb per hr of 100 F air and 16,000 lb per hr of gas at 770 F, and has a rated air side effectiveness of 92.2 per cent.

(More News from the Plants on page 150)



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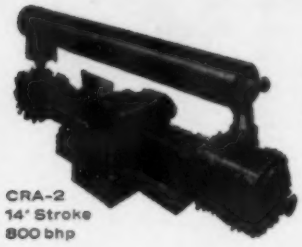
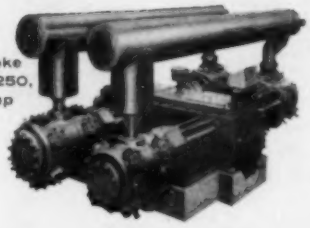
8" Stroke
200, 250, 300 bhp

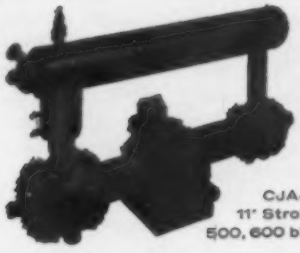
Whatever your requirements for industrial air,



CRA-2
14" Stroke
800 bhp

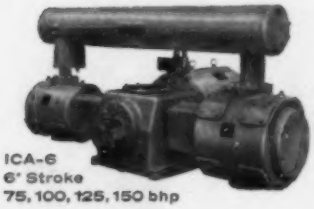


CRA-4
14" Stroke
1000, 1250,
1500 bhp

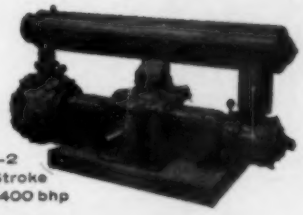


CJA-2
11" Stroke
500, 600 bhp

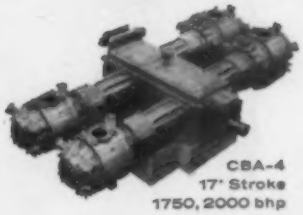
there's a Clark Balanced/Opposed Compressor



ICA-6
6" Stroke
75, 100, 125, 150 bhp



CMB-2
8¾" Stroke
350, 400 bhp



CBA-4
17" Stroke
1750, 2000 bhp

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Six Stroke Sizes...23 Models. The Balanced/Opposed design is only one of many innovations that have made Clark air compressors the most dependable in industry today. Rugged and compact, they are specifically designed to handle your "100 lb." air requirements most economically. ■ Born of exhaustive research and proved by millions of hours of service, Clark Balanced/Opposed Industrial Air Compressors are engineered for maximum performance and reliability. They come equipped with "Simplaire" Valves—the simplest air compressor valves in the industry . . . easy to put together, easy to take apart, and *easy on your maintenance budget*. From a comprehensive line of 23 models, you can pick the compressor that's *right* for your needs. Sizes from 75 to 2000 horsepower; capacities range upward from 375 cfm. ■ For all the reasons why you'll be dollars ahead with Clark compressors, contact your Clark representative today, or write for Bulletin 185, **Clark Bros. Co., Olean, N.Y.**

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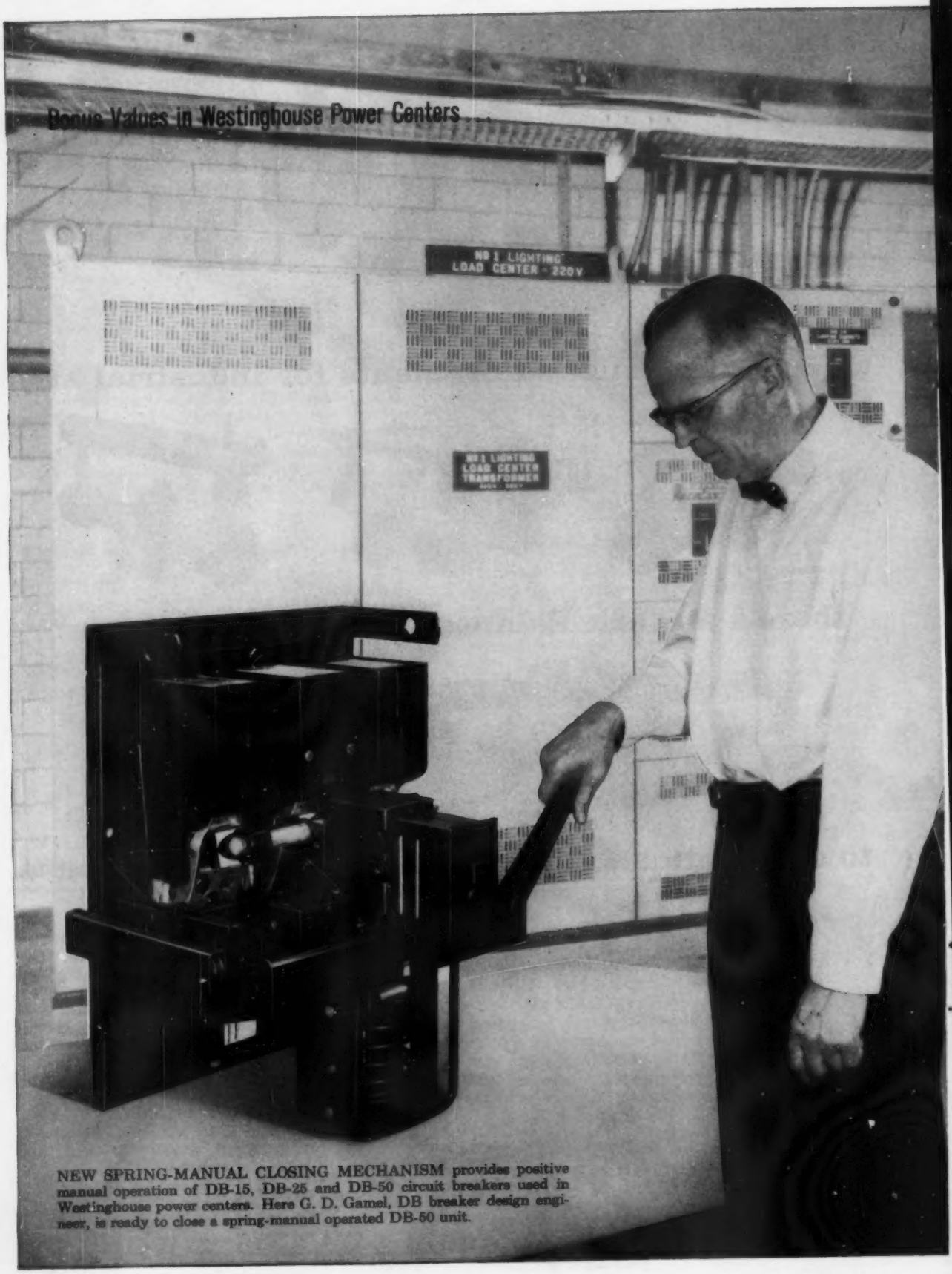


NEW SPRING-MANUAL CLOSING MECHANISM provides positive manual operation of DB-15, DB-25 and DB-50 circuit breakers used in Westinghouse power centers. Here G. D. Gamel, DB breaker design engineer, is ready to close a spring-manual operated DB-50 unit.

Westinghouse power centers offer greatest component selection... plus new switchgear insulation

You Can Choose the Breaker Operation You Need. Low-voltage air circuit breakers (DB-15, DB-25 and DB-50) provided in Westinghouse power centers are now available with a choice of manual, spring-manual or electric closing mechanisms. In accordance with industry standards, DB-75 and DB-100 breakers are available with an electrically operated closing mechanism only.

You Can Choose the Transformer You Need. As with breaker closing mechanisms above, Westinghouse gives you complete freedom of choice in selecting the power center transformer best suited to your application. Within code limitations, you can choose *oil-filled* for outdoor service . . . *Inerteen®-filled* for outdoor or indoor service where a nonflammable, liquid-cooled transformer is desirable . . . *ventilated dry-type* for maximum safety and minimum maintenance under controlled atmospheric conditions, indoors . . . and *sealed dry-type* for complete safety and virtually no maintenance, under adverse atmospheric conditions, indoors or outdoors.

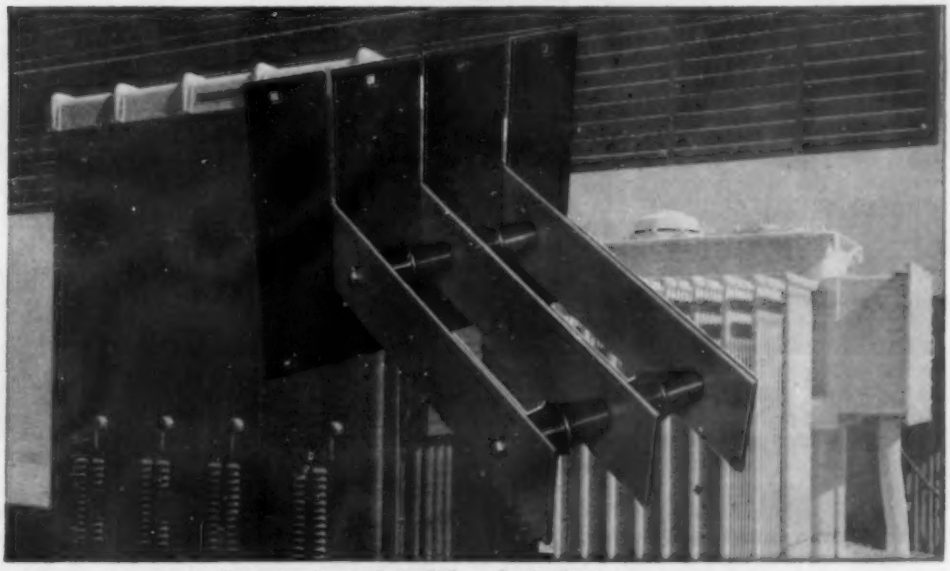
New Westinghouse Insulation of improved glass polyester material is used for bus supports and short circuit bracing in Westinghouse low-voltage metal-enclosed switchgear. In addition to being highly track resistant, this new insulation is also flame retardant, and the design of supports and bracing provides increased vertical creepage distances. Result is maximum safety with minimum maintenance.

These features are only a few of the continuing product improvements that provide true bonus values beyond specification in Westinghouse power centers. For complete details, call your Westinghouse representative—or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60979

YOU CAN BE SURE...IF IT'S Westinghouse

NEW WESTINGHOUSE GLASS POLYESTER INSULATION is used for bus supports and bracing in low-voltage metal-enclosed switchgear of Westinghouse power centers.



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Roller Straighteners Handle All Shapes, All Sizes of Structurals

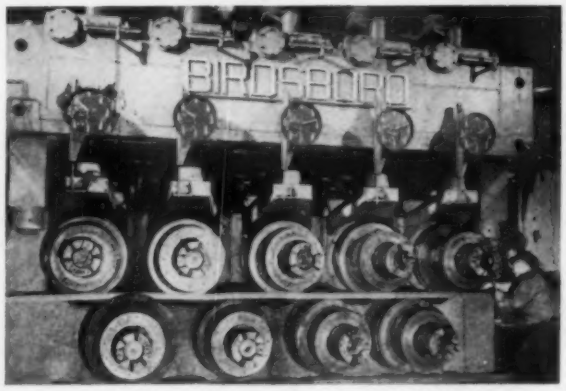
TWO OVERHUNG ROLLER STRAIGHTENERS installed at the South Chicago works of United States Steel Corp. are straightening the wide variety of structural shapes produced in the plant's structural steel mill.

The machines can straighten wide flange beams up to 16 in. in width, standard beams up to 15 in. wide, channels up to 18 in. wide, angles up to 8 in. by 8 in. by 1⅛ in. They can also handle sheet piling and other special shapes.

Both units, engineered and built by Birdsboro Corp., are nine-roll machines. Each has five vertically adjustable top rolls and four vertically non-adjustable bottom rolls, all of which are adjustable axially.

Vertical and axial roll adjustments are electrically motor powered. The main variable speed d-c motor operates the equipment at workpiece speeds ranging from 300 to 750 fpm.

Vertical pinch rolls on the entry side and vertical pressure rolls on the delivery side feed and guide materials to be straightened. The pressure rolls also aid in decambering.



When the equipment straightens beams and channels, each roll is built up using two roll rings and a series of split spacers. When other sections are handled, a solid pre-shaped roll is used.

Giant-Size Dispenser Protects Sheets and Plates with Pressure-Sensitive Tape

BELIEVED TO BE THE LARGEST tape applicator of its kind, a new automatic machine has been designed to apply protective pressure-sensitive tape to large surfaces of flat sheets and plates.

The machine, seven feet wide and 20 ft long, was manufactured by Westoak Manufacturing Corp., for Kaiser Aluminum & Chemical Corp., for coating aluminum sheet up to 84 in. wide and 200 in. long. It can cover a sheet this size with tape in only 17 seconds.

Tape used for the application was a Minnesota Mining and Manufacturing Co. product, which consists of a thin, smooth and pliable paper backing combined with an elastic film-like adhesive, which adheres instantly when rolled on by the machine.

Two knife blades cut the tape to the desired lengths, as the machine operates. Two tape roll shafts unreel tape simultaneously over a single neoprene-coated pressure roll, and the machine has a maximum coating speed of 50 ft per minute.

A one-horsepower motor, mounted at the center of the carriage, drives the machine. It is equipped with a reversing switch and magnetic brake.

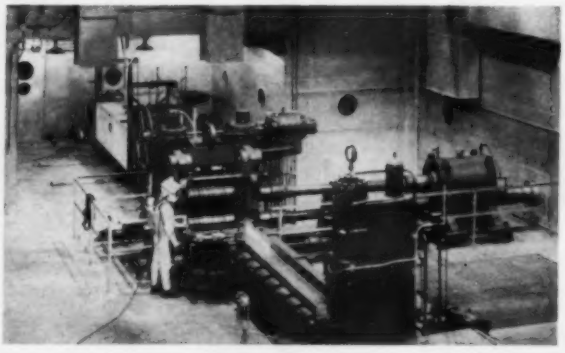
Space-Suited Workers Monitor Metalworking in Argon-Atmosphere Room

REFRACTORY METALS of unusually high integrity, for future hypersonic aircraft and aerospace weapons, are being produced in Universal-Cyclops Steel Corporation's new InFab (Inert-Fabrication) facility located at Bridgeville, Pa.

InFab was conceived, designed and constructed in technical cooperation with the Navy's Bureau of Naval Weapons, to produce refractory metals such as molybdenum, columbium, tantalum, tungsten, and their alloys.

The facility is a welded steel enclosure 42 ft wide, 97 ft long and 23 ft high. Inside the enclosure are an impactor, rolling mill, furnaces, a 10-ton crane and space for additional equipment. Forging and rolling of the metals will be performed at temperatures up to 4500 F, in the protective atmosphere of argon gas.

The machinery in the facility was designed to be fully automatic, controlled from consoles outside the sealed room. Some manual handling is required, and plans call for experiments on hot machining and welding.



Technicians entering the room are dressed in a modified design of space suits. They wear a four-layer gas-tight suit with an outer garment which provides shielding from thermal and ultraviolet radiation; they carry their air supply and a cooling unit on their backs.

CHAINS FOR EVERY SERVICE

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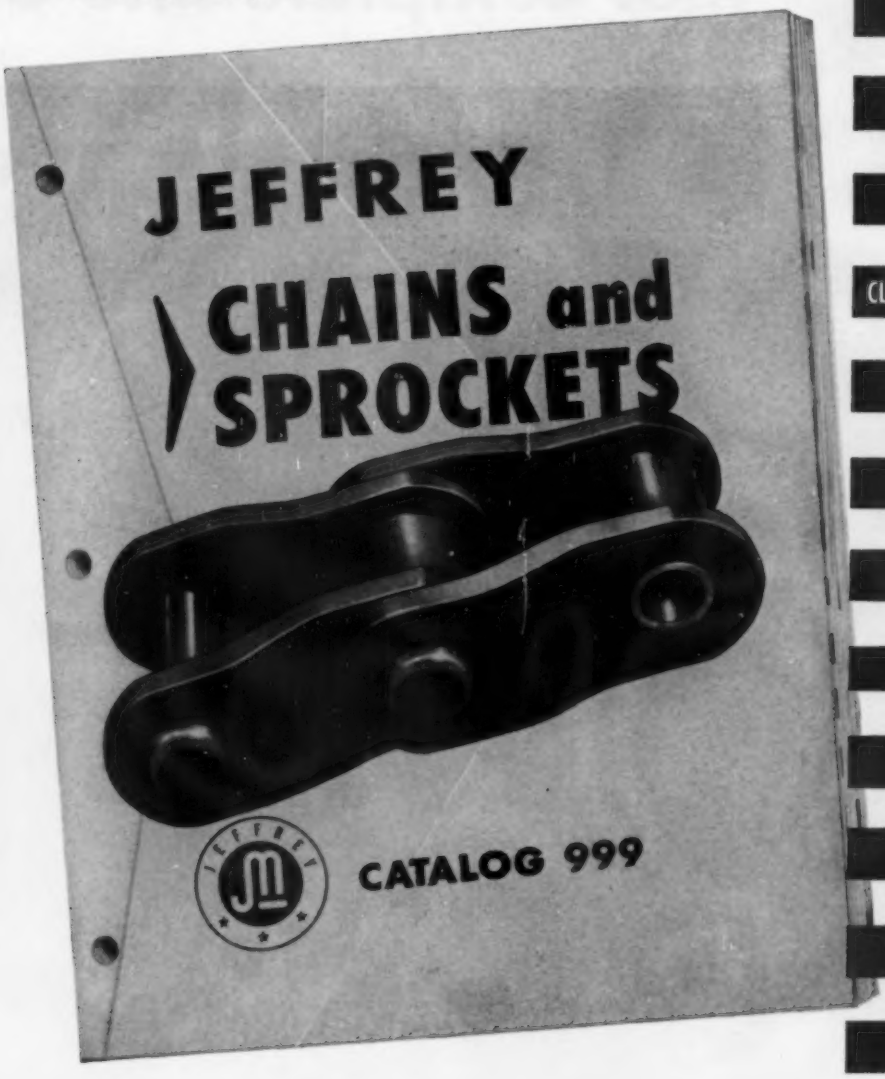

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MEN WHO SELECT CHAIN for power transmission and conveying applications will find this new Jeffrey catalog extremely helpful. It recommends types of chains and sprockets for various applications, simplifying selection of the best and most economical for each job. Jeffrey has the experience in designing and engineering to help you in any specific job—conveying, elevating or transmission drive application. For service on your chain requirements, call your nearest Jeffrey sales office or Jeffrey distributor.

For a copy of Catalog 999, write The Jeffrey Manufacturing Company, 905 North Fourth Street, Columbus 16, Ohio.

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"Here's a shot of our Delroyd Verso worm gear — one of hundreds being boxed and made ready for shipment. Unlike most speed reducers, this Verso unit can be mounted in any position — horizontal, vertical, upside down. • "This is but one model in a complete line of Delroyd worm gear reducers — with the widest range of horsepowers and sizes in the industry."*

*1⅛" center distance, fractional horsepowers — to 12" center distance, 152 horsepower. Reducers to 36" center distance with horsepower capacities to 700 are supplied as standard. Larger units to meet any requirement can be supplied on special orders.

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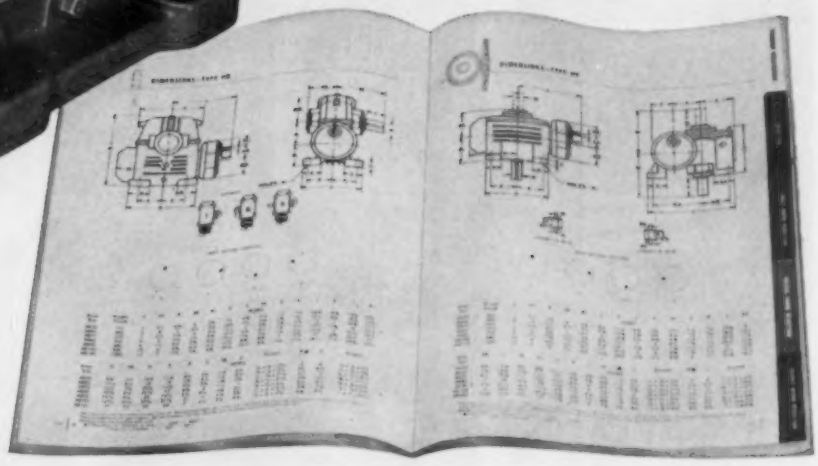

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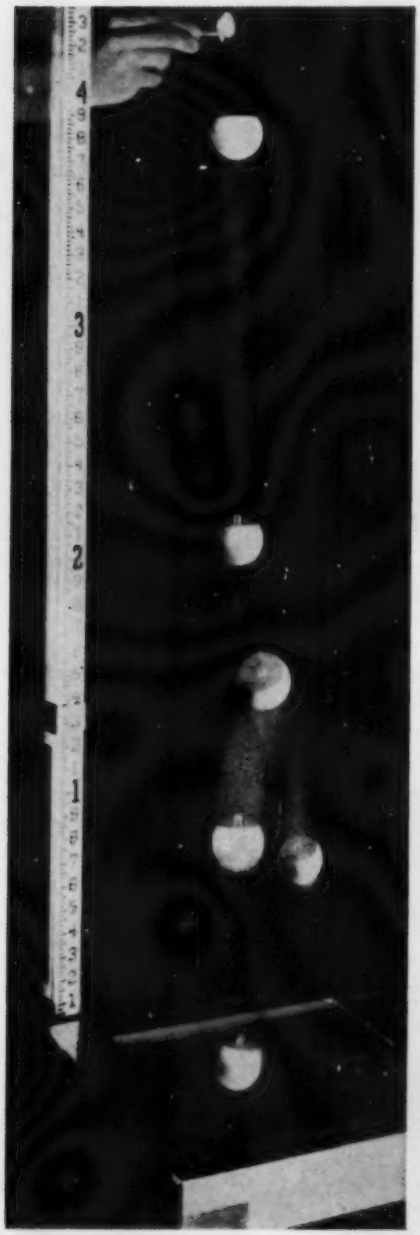
DL-210

The answer to a maintenance man's prayer . . .

END WINDOW BREAKAGE PROBLEM FOREVER WITH JOHNS-MANVILLE CORRULUX. When you glaze with Johns-Manville Corrulux, worries about window breakage end forever. Corrulux is strong, impact-resistant, yet provides efficient, diffused daylighting.

. . . Johns-Manville CORRULUX



SHATTER-PROOF! When a 2½ inch steel ball weighing 2.06 pounds was dropped from 4 feet, no damage was done to a Structural Grade Corrulux Flat Pane. The ball bounced approximately 1½ feet.

EASY TO WORK . . . EASY TO HANDLE. For special shapes and sizes, Corrulux may be cut with a power saw, hacksaw or handsaw. It drills and fastens just as readily. No tricks to learn. Light and easy to handle, Corrulux Flat Panes come in sizes to fit most windows.

EASY TO INSTALL. Simply replace glass panes with flat panes of shatter-proof Corrulux. They install as easy as glass, yet protect against future damage from storms, vibration, vandalism and other hazards. And Corrulux eliminates glare, spotlighting and harsh shadows because it diffuses light at all angles as it admits over 80% of the light that strikes its surface.

WHERE TO GET IT. Pioneer in its field, Johns-Manville Corrulux offers you the finest translucent panel on the market consistent with an economical price. For further details, see the Yellow Pages under *Plastics*, or write Johns-Manville, Box 158, Dept. PE-8, New York 16, N. Y. In Canada, address Plastics and Allied Building Products, Ltd., Dundas, Ontario.

JOHNS-MANVILLE

CORRULUX is a registered trademark of the Johns-Manville Corporation

JOHNS-MANVILLE JM PRODUCTS

For more facts circle 569 on Reply Card

MODERN MAINTENANCE

IS PROFITABLE MAINTENANCE

R. L. Kirkpatrick, *Manager, Maintenance Sales*, Westinghouse Electric Corporation

The Fourth Factor of Production ... The Maintenance Engineer

Many plant managements today are building their hopes, dreams—and profits—on a servant of enormous power and promise, automation. The automatic plant or production line means a complex of interrelated equipment including electric and electronic instrumentation, even computers. Once separate machines or production processes are now interdependent. Failure of equipment anywhere on the line brings production to an immediate and expensive slowdown or standstill. Unplanned outages can today cost 10 to 100 times what they did a few short years ago.

Management recognition of the basic need for production reliability is creating a new giant in the productive process . . . the maintenance engineer. In 1957, an increasingly automated industry counted 21% of its payroll in

Production reliability assured with

The necessity of keeping your electrical equipment operating at top efficiency becomes increasingly important as you increase the use of electrical energy and as the electrical equipment becomes more complex. Excessive down time or substandard production quality due to equipment failure can make the difference between profit and loss in your plant.

To help you keep your plant operating at a profit we offer you "Modern Maintenance." This is not a substitute for your own preventive maintenance program, but is designed to supplement it. We would like to have the opportunity of reviewing your present maintenance operation with you. By coordinating our program with yours, you can be assured of securing the lowest cost and most effective maintenance.

Our Modern Maintenance includes inspection, testing, modernization, field service, shop repair, and renewal part recommendations backed by highly trained specialists, up-to-date facilities and all the benefits of Westinghouse research and development.

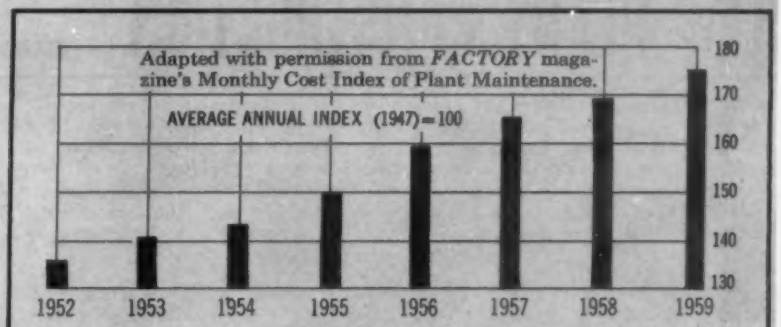
Our maintenance specialists are men who know about the maintenance of electrical, electronic or steam equipment. When they repair a machine they check it thoroughly—both electrically and mechanically—and include in its repair every possible new development. In this way your equip-

Polyester glass banding is applied to armatures and wound rotors of various ratings with a special Westinghouse-developed tension device, insuring a strength factor equal to steel.

maintenance personnel, 77% in production. Today, three years later, in its new plants, the proportion has changed to 50-50.

Emphasis on reliability has focused management's attention on the need for highly skilled men in the maintenance function. This means the accent is on selection and training, often extensive and highly specialized. The newly emergent maintenance man often is an engineer-technician, perhaps the most skilled workman in the shop. He is thoroughly conversant with all the equipment for which he is responsible. He is able to locate and eliminate trouble quickly. He is skilled in the all-important measures of preventive maintenance.

In short, maintenance is today one of the most important plant functions alongside power, labor and materials. Maintenance is considered a necessary part of the production process and must carry its share in producing a profit. Does your maintenance program contribute its share to your company's profit? It will pay you to find out.



Steadily rising plant maintenance costs continue upward in first quarter of 1960, estimated to top previous high of 1959 by more than 2%.

Westinghouse maintenance service

ment is not only repaired but modernized—actually made into better equipment than it was when it was new. For example, when these men rewind motors, they can use revolutionary insulation processes such as Super COILIFE* or Thermalastic® that give motors extra life—processes that were not developed when the motor was built years ago.

Fast repair service is available from our 42 Repair Plants that are equipped with the latest facilities and processes, with skilled craftsmen to rebuild and *modernize* your equipment.

Fast shipment of renewal parts is assured from our 46 warehouses strategically located in industry centers. Parts are generally shipped within hours after they are ordered. This allows you to make a substantial reduction in your parts inventory. Our maintenance specialists will gladly outline a minimum inventory to meet your operating requirements.

Fast, one-day delivery for renewal parts is guaranteed when you order from your local Westinghouse warehouse.

At the heart of this Modern Maintenance program is the periodic inspection and testing of your vital electrical and steam equipment by our highly trained maintenance specialists. This program covers complete electrical and mechanical inspection and testing.

We would like you to invite one of our Westinghouse sales engineers to talk with you and others concerned with electrical equipment maintenance in your plant. He will review your requirements and will draw up a proposed Modern Maintenance program tailored to your needs. He will also be interested in reviewing your present maintenance program and offer recommendations based on his broad experience in this field. He would like to have you and your people visit your local Westinghouse Repair Plant. J-95216

*Trade-Mark

Westinghouse

For more facts circle 570 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Snowflake, Ariz.—Southwest Forest Industries, Inc. plans to construct a $32.5-million newsprint and kraft paper mill on a 640-acre site that the company recently acquired. Plant is scheduled to go into production by late 1961 and the firm expects to be producing kraft paper in October while newsprint production is slated for later that year.

Culver City, Calif.—Motorola, Inc., 4545 W. Augusta Blvd., Chicago, Ill., plans to invest $1.2 million in plant and equipment for expansion and modernization of company's commercial aviation electronics business. Included in the expenditure is the purchase of a 25,000-sq ft building in this city, with plans for the construction of a 37,000-sq ft addition. Work on the new structure is already under way and is scheduled to be completed before the end of this year.

Tampa, Fla.—Metal & Thermit Corp., 100 E. 42nd St., New York, N. Y., plans to construct a detinning plant to be erected in this city. New plant will have an initial capacity of 18,000 gross tons per year. Construction of the new facility will get under way at once and will be completed by the end of 1960.

Decatur, Ga.—Kraft Foods Company, Division of National Dairy Corp., 500 N. Peshtigo Court, Chicago, Ill., plans a 188,000-sq ft addition to company's present plant of 375,000 sq ft located here. Work on the new addition will get under way at once and will include 4¼ acres of new plant and office space. Included in the plans are provisions for 49,000 sq ft of cooler space for storing perishable goods and 133,000 sq ft of dry grocery warehouse space. Plant, when completed late in 1961, will cost in excess of $2 million.

Gurnee, Ill.—Hoerner Box, Inc., Keokuk, Iowa, plans to start construction at once on a 180,000-sq ft corrugated box plant on a large site in this city. Construction is scheduled to begin as soon as ground preparations are completed. New facility will be completed in 1961 and will represent an investment of approximately $3 million.

Terre Haute, Ind.—Weston Paper & Manufacturing Co., Harries Building, Dayton, O., plans to construct a 150 ton per day semi-chemical pulp mill for the Terre Haute, Ind., Division of the company. Rust Engineering Co., Pittsburgh, Pa., will design the new unit to utilize hardwood instead of straw for manufacturing paper liner boards. Construction of the new facility is already under way and the mill is scheduled to go into operation by the summer of 1961.

South Shore, Ky.—Hooker Chemical Corp., 1940 Ward St., Niagara Falls, N. Y., plans to construct a multi-million dollar plant here for the production of synthetic phenol by a modified chlorination process. Construction of the new facility will begin in the fall on a 165-acre site on the Ohio River about five miles upstream from Portsmouth, O., and completion is anticipated by the early part of 1962.

Detroit, Mich.—American Metal Products Co., 5965 Linsdale St., this city, plans major improvement program at local plant operations. Company will spend more than $6 million in tooling and like equipment for improving its production capacity of track axle housings.

Minneapolis, Minn.—Minneapolis-Honeywell Regulator Co. will build a 227,000-sq ft multi-million dollar addition to its present 273,000-sq ft manufacturing plant and central distribution center in Golden Valley, a Minneapolis suburb. Addition will be completed in mid-1961, and company will transfer certain temperature control manufacturing and assembly operations to this plant.

Minneapolis, Minn.—The W. A. Sheaffer Pen Company, Fort Madison, Iowa, plans to construct a large new plant for its Minneapolis subsidiary, Maico Electronics, Inc. The new plant will house engineering, production, and administration operations and will provide space for expanding research and development work for Government and Industry. Work on the new plant will get under way soon with completion scheduled for late 1961 at a reported cost of $1.5 million.

Camden, N. J.—Radio Corporation of America, Victor Radio and Victrola Division, has awarded a contract to the Turner Construction Company, 420 Lexington Ave., New York, N. Y., for a two-story office and training center for computer engineers at company's plant located in the Cherry Hill area. New building will have 75,000 sq ft of floor space and will blend architecturally with business structures in the area. Plant will be completed by the end of this year at a cost of about $1 million.

Fort Edwards, N. Y.—General Electric Co., 1 River Rd., Schenectady, N. Y., plans to build a major addition to company's present capacitor manufacturing plant located here. The installation will turn out capacitor grade aluminum foil. Construction of the plant will begin at once for completion about mid-1961. Plant addition will cost about $2 million.

Niagara Falls, N. Y.—Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O., plans expansion of production facilities at its vinyl resins plant located here. New facilities will add about 20 million lb annually to the plant's total capacity and will double production capacity for two specialty dispersion resins handled by the company's Goodyear Chemical Division. Additional facilities are expected to be in production late this year. Over-all expansion program is expected to cost about $1 million.

Wilmington, N. C.—Ideal Cement Company, Denver National Building, Denver, Colo., plans to build a multi-million dollar cement plant. New facility will have a capacity of 1.5 million bbl of cement annually. Work will get under way as soon as preliminary engineering work has been completed and plant will be in operation by the spring of 1962.

Cleveland, O.—Republic Steel Corp., 1405 Republic Building, will start work immediately on a $26-million plant improvement program at its Cleveland Works. The first two projects to be completed will be the modernization of the benzol refining facilities at an estimated cost of $8.95 million and the replacement of coal preparation facilities at the No. 1 coke plant at an estimated cost of $4.1 million. Preliminary work is also under way on an $11.6-million modernization of the plant's 10 in. bar mill. Final phase of the program will be a $1.2-million improvement of material handling facilities to the plant's No. 2 open hearth shop, through installation of elevated tracks and conveyors over Independence Rd.

Powhatan, O.—North American Coal Corp., Cleveland, O., will build a $1-million plant to produce high purity aluminum sulfate from coal mine wastes. Facility, the first of its kind, will use a process developed under a joint program with the Strategic Materials Corp. Plant will have an annual capacity of 40,000 tons a year and is scheduled for initial output in the summer of 1961.

Toledo, O.—Sun Oil Co., Walnut and Sixteenth Streets, Philadelphia, Pa., plans to construct a large plant for the production of high-grade naphthalene from petroleum. Plant, reported to cost in excess of $8 million, will be erected at company's refinery located here, and will have a capacity of 100 million lb per year.

Pittsburgh, Pa.—H. K. Porter Co., Inc., Alcoa Building, has work under way on a construction and modernization program at its Bessemer, Ala., and Wellsville, O., plants of its Refractories Division. Site preparation already has started and construction of buildings will begin at once. Major items in the $4-million modernization program include two new tunnel kilns at Wellsville, O., and one at Bessemer. Swindell

(Continued on page 232)

Most accurate of all mechanical variable speed drives:

positive Infinitely Variable P.I.V.

For stepless, slipless speed changing, there's nothing like Link-Belt P.I.V.—the *only* chain-driven variable speed drive.

With P.I.V., teeth—not tension—assure positive, high-efficiency power transmission. You can select any speed in its range—find it instantly, hold it indefinitely. The exclusive all-metal, self-tooth-forming chain meshes with radially grooved wheels . . . maintains positive, nonslip contact at any speed under all loads.

P.I.V. drives are fully enclosed . . . unaffected by atmospheric conditions. They're available in 8 sizes, 16 standard types, capacities from ½ to 25 hp. Type RS is available in capacities up to 50 hp.

For full details, ask your Link-Belt district sales office or authorized stock-carrying distributor for Book 2274. You'll find them in the yellow pages of your local phone directory under Power Transmission Equipment.

INSTANT SPEED CHANGING is achieved by simply turning handwheel to desired position on easy-to-read dial. P.I.V. drives are also available with electric, pneumatic or hydraulic controls. Here P.I.V. drive and Link-Belt roller chain accurately regulate speed of rolls in roller-hearth furnaces used to heat-treat jet engine parts.

LINK-BELT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

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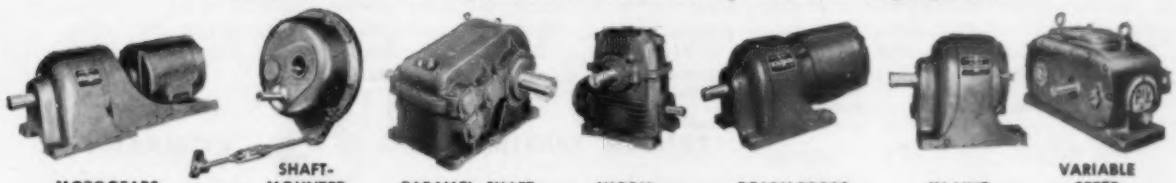
LINK-BELT has the right reducer for every need, every speed



MOTOGEARS | SHAFT-MOUNTED | PARALLEL SHAFT | WORM | GEARMOTORS | IN-LINE | VARIABLE SPEED

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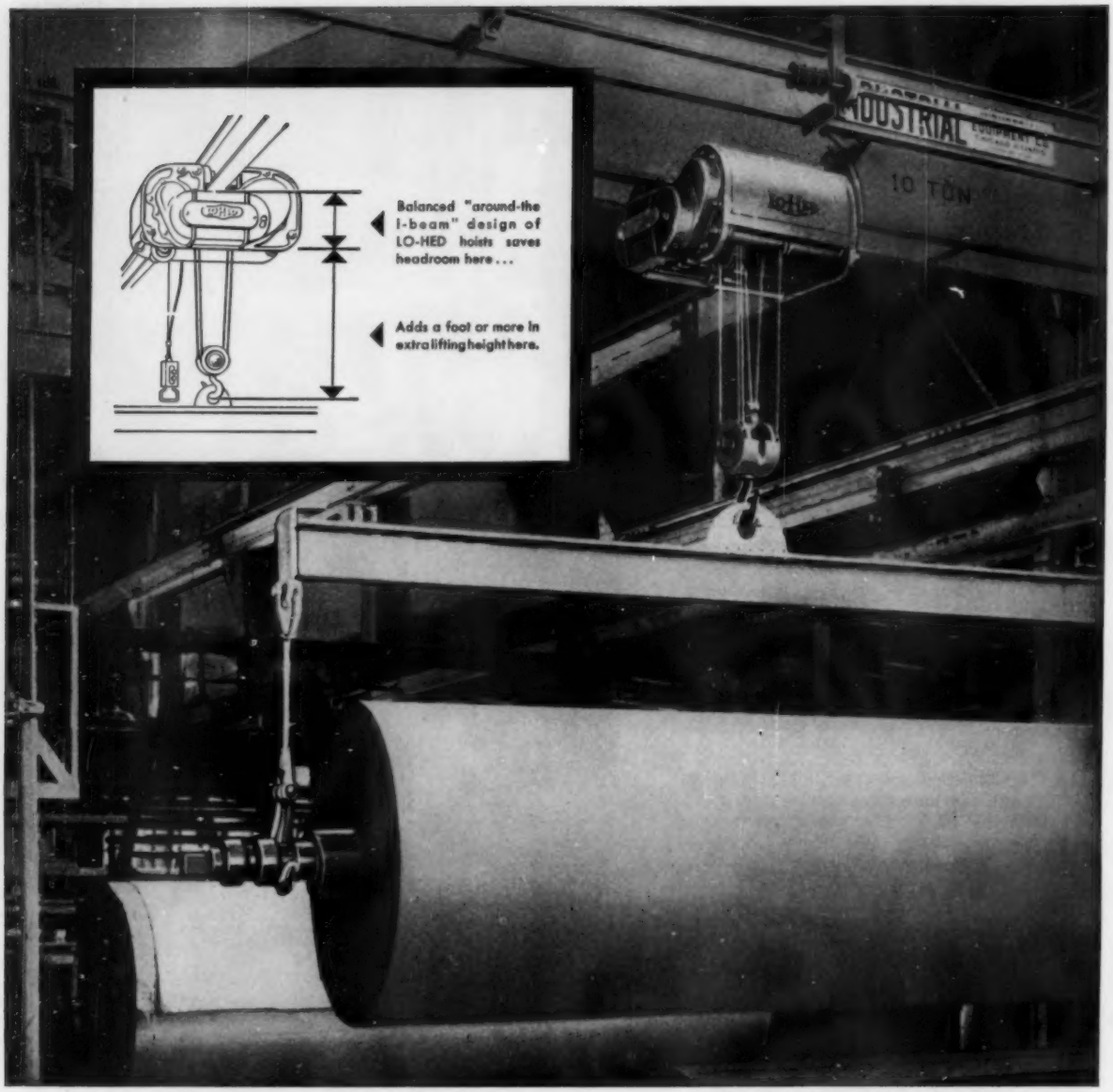
Balanced "around-the I-beam" design of LO-HED hoists saves headroom here...
Adds a foot or more in extra lifting height here.
10 TON

When headroom is critical...

LO-HED® HOISTS ADD EXTRA FEET OF LIFTING HEIGHT

When you are faced with a ceiling height that can't be changed... yet need more lifting height to solve an aerial handling problem... then check the exclusive low headroom advantages of AE LO-HED hoists. A LO-HED will give you those critical extra feet of lifting height that help clear obstructions that couldn't be cleared before ... move materials where they couldn't be moved before. When you install a LO-HED, it is like adding a foot or more to the height of your plant. Or, if you are putting up a plant addition, you can save a foot or more in building height and have the same ability to move materials. In terms of brick, mortar and steel, this can mean savings of many times the cost of your hoist investment.

And thats not all. LO-HED hoists are the "heavies" of the heavy duty hoists. They will outperform any heavy duty hoist you have ever used... regardless of performance requirements.

To see how a LO-HED can solve your headroom problems, write for our new catalog H-59, or see condensed catalog data in Sweets Plant Engineering File 1a/Ae. AMERICAN ENGINEERING COMPANY, Dept. **H-164**, Philadelphia 37, Pennsylvania.

Division of United Industrial Corporation

AMERICAN ENGINEERING COMPANY

Hale-Shaw and Hydramite Pumps • Lo-Hed Hoists • Vibra-Grate, Perfect Spread and Taylor Stokers

AE Marine Deck Auxiliaries.

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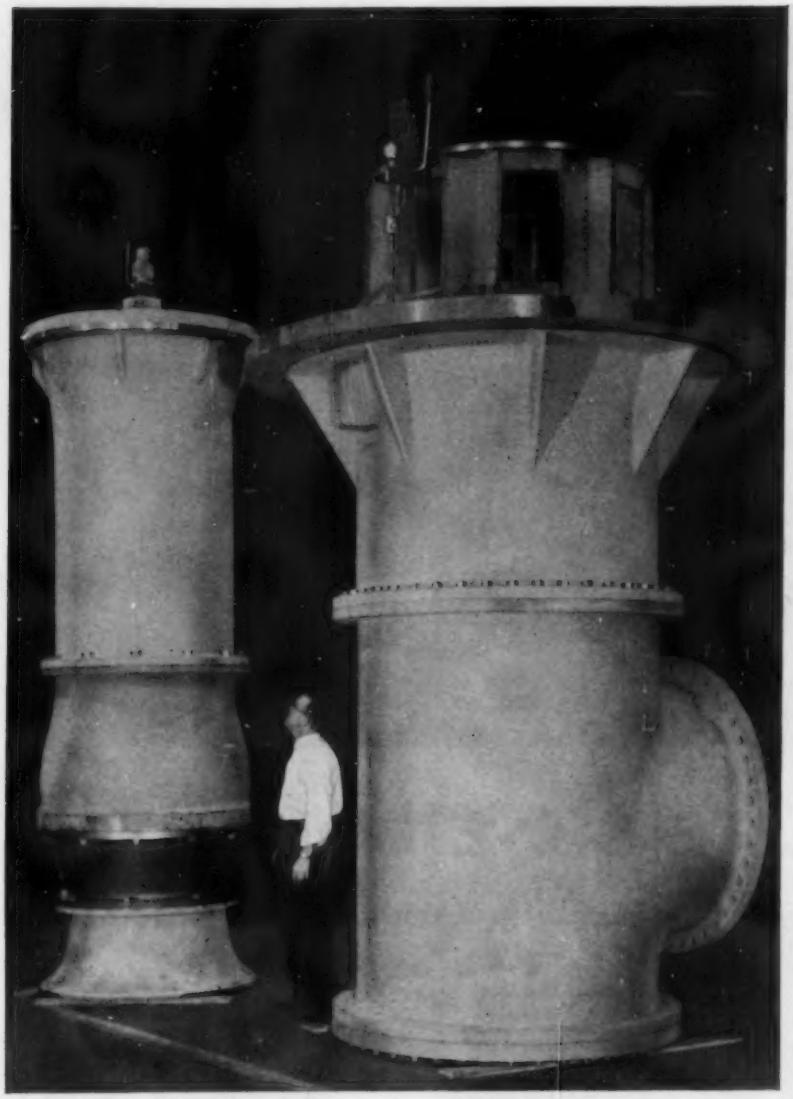

Casing a big job—The heavy casing for these pumps for a Florida power plant is made of 2% nickel cast iron. With its tight, uniformly dense grain structure, nickel cast iron improves pressure tightness and tensile strength. The larger pump can deliver cooling water to a condenser at the rate of 88,000 gpm.

Stepping up fluid handling efficiency

Iron castings meet heavier demands...when alloyed with Nickel

Higher loads...higher pressures... higher temperatures...you can safely have them with nickel cast irons.

Through the use of Nickel—alone or in combination with other alloying agents—the engineering properties of cast iron can be *controlled*. And this control can be precise enough to meet a great variety of service requirements encountered today.

Nickel alloyed gray iron castings are widely used throughout industry. Here are some of the advantages they offer:

- Improved tensile and compressive strengths
- Greater resistance to wear
- Easy castability—uniform density throughout light and heavy sections
- Ready machinability with good physical properties
- Improved rigidity
- Uniform response to heat treatment
- Improved resistance to heat and thermal shock
- Pressure tightness

You'll do well to specify nickel cast irons for original plant construction in fluid handling applications...and for replacement parts in compressors ... pumps ... valves ... cylinders ... liners ...

Six different types of nickel cast irons, corresponding to ASTM specifications, can be adjusted to meet specific service needs.

Full information on all the nickel cast irons can be found in our 28-page illustrated bulletin, "Engineering Properties and Applications of Nickel Cast Irons." A copy belongs in your reference files, and we'll be glad to send one on request. Just ask for "Bulletin A-69."

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N.Y.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

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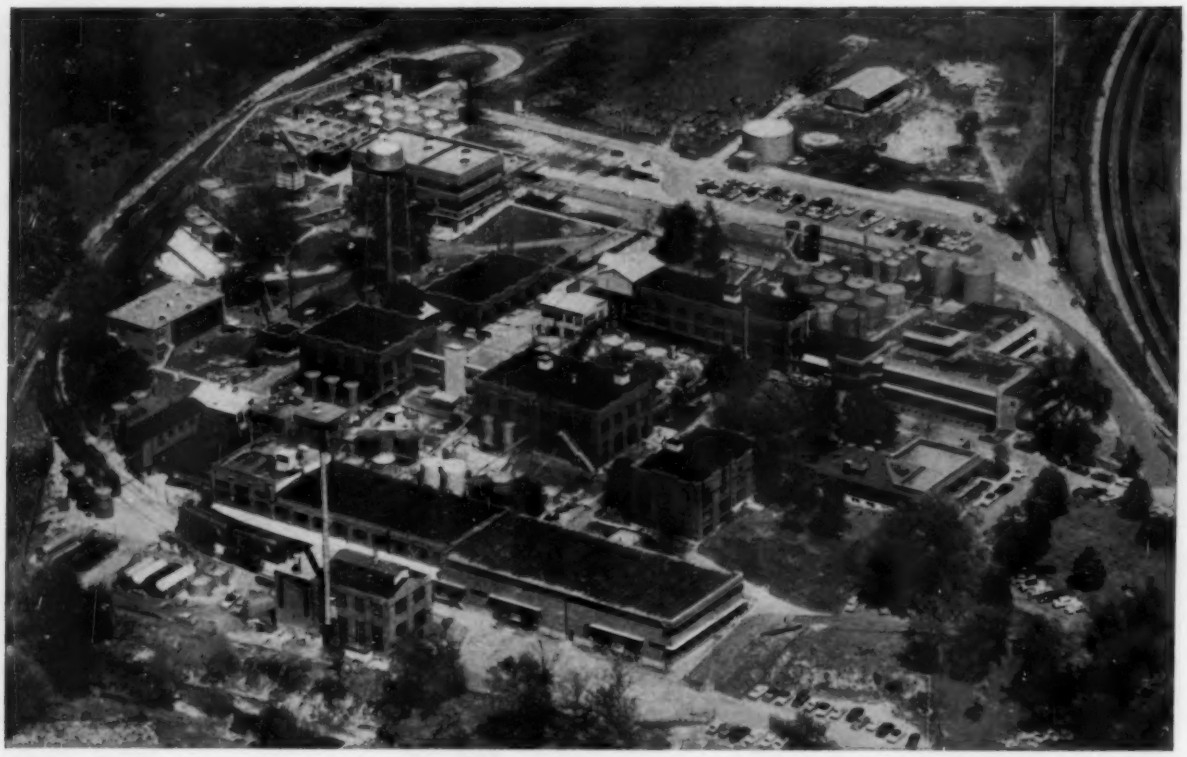

TRETOLITE'S C-E BOILER

carries fluctuating load efficiently burning either coal or gas

A completely dependable source of steam, capable of responding quickly to load fluctuations, is essential for efficient operation in the Tretolite Company's process of manufacturing oilfield chemicals. In 1958, Tretolite, a leading producer of chemicals for industrial use, began operation at its St. Louis plant of a C-E Vertical-Unit Boiler, Type VU-10, fired by a C-E Chain Grate Stoker and equipped to burn gas as an alternate fuel.

The company now reports that this unit has provided thoroughly dependable and efficient steam output firing either coal or gas. Because the Tretolite plant is situated in a residential area, every precaution must be taken to avoid air pollution. Since the C-E Chain Grate Stoker minimizes release of fly ash, Tretolite is able to burn coal without objectionable stack emission.

Combustion's VU-10, designed for use with coal, oil or gas . . . and with capacities ranging from 10,000 to 60,000 pounds of steam per hour . . . is making a consistently good record in hundreds of installations here and abroad. It is just one in C-E's complete line of standardized industrial boilers, built in capacities ranging from 4,000 to 150,000 lb of steam per hour, and designed to provide the best in reliable, low cost steam production. Investigate C-E's advanced designs for your own steam requirements.

Partial view of the C-E Vertical-Unit Boiler, Type VU-10, with C-E Chain Grate Stoker installed in the St. Louis Plant of the Tretolite Company. This unit has a continuous capacity of 40,000 lb steam per hr.

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

***Canada:* Combustion Engineering-Superheater Ltd.**

C-289

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

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New General Electric Heavy Duty Switches safely withstand 200,000-amp. short circuit!

All new General Electric heavy duty (TH) and heavy duty interrupter (THD) safety switches were recently tested for short circuit operation with current limiting fuses at G.E.'s High Voltage Test Laboratory in Philadelphia. The results prove that both TH and THD switches will stand up under a 200,000-ampere short circuit when used with General Electric CLF* high interrupting capacity fuses or other current limiting fuses of comparable characteristics as defined in NEMA Standards FU1-1959. An independent engineering firm supervised the tests and certified all results.

General Electric Switches are rated 30 to 600 amperes, 240 to 600 volts, and are available in both NEMA 1 and gasketed 1A enclosures. See your G-E Distributor.

*TRADE-MARK

Typical 3 Phase Tests of G-E Heavy Duty Safety Switches at 200,000 Amperes Available

Type Switch	Average Available Symmetrical Amperes	Circuit Voltage		Duration of Max. Peak Current Flow	Type of Test	
		Open	Closed		Close Device On Fault	Close Fault On Device
Heavy Duty 600 Volts a.c. Type TH	210,000	610	497	18°	X	
	210,000	610	497	36°		X
Heavy Duty Interrupter 250 Volts a.c. Type THD	203,000	256	222	18°	X	
	203,000	256	222	18°		X
Heavy Duty Interrupter 600 Volts a.c. Type THD	210,000	610	497	18°	X	
	210,000	610	497	36°		X

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.
For more facts circle 575 on Reply Card

5,500 ALUMINUM fittings and

Only Killark provides such design flexibility!

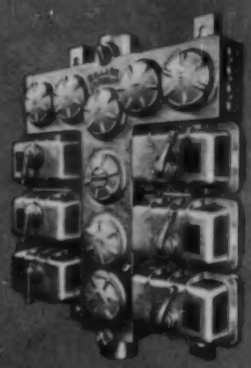
Killark knows that modern designers must have freedom to choose from a *complete* selection of electrical fittings and fixtures. That's why the Killark line contains more than 5,500 enclosures of all types and sizes. No matter how unusual or varied the requirements, whether in hazardous or non-hazardous locations, Killark can supply them *all* from this vast stock.

Killark fittings and fixtures give added design flexibility because they are cast only from *aluminum*. This means they are non-sparking and non-magnetic. Their light weight is an important factor in many applications; they're easier to install. They're ideal for certain areas where corrosion is a problem, permanently rustproof, non-staining. They dissipate heat much more efficiently than conventional metals.

Remember these decided Killark advantages when planning specifications. You'll find that Killark—and aluminum—serves your design needs best.

Killark PROVIDES ENCLOSURES FOR CONTROL EQUIPMENT

... All large junction boxes, as well as enclosures for motor starters, circuit breakers, disconnect switches and panel boards are readily available from your Killark dealer. These all-aluminum fixtures, in weather-proof or explosion-proof styles, are designed to give maximum efficiency. They're ribbed for greater strength and faster heat dissipation so vital to accurate operation of thermal devices. They feature space-saving rectangular construction, convenient mounting lugs.



PANEL BOARDS

Complete with specified breaker, wiring, seals, connections—ready to install. One piece wiring trough, rectangular or "T" style. Wide cover openings give plenty of hand room. Custom assembled for your job.

Write for the Killark Catalogs...

Killark PROVIDES COMPLETE ASSEMBLIES FOR CONTROL RACKS

A special Killark engineering service provides complete assemblies of all sizes and types (such as switch rack assemblies) designed and built to meet an exact need. For example, Killark will prepare and submit a preliminary blueprint according to specifications. After approval, the entire unit is assembled, wired, and sealed at the factory —*the Killark-engineered unit is delivered ready to connect to power.* This custom service saves an enormous amount of assembly work at the job site.

Killark

KILLARK ELECTRIC MANUFACTURING CO.

Vandeventer and Easton Ave. • St. Louis, Missouri

In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

fixtures from which to choose...

Killark PROVIDES A COMPLETE LINE OF CONDUIT FITTINGS

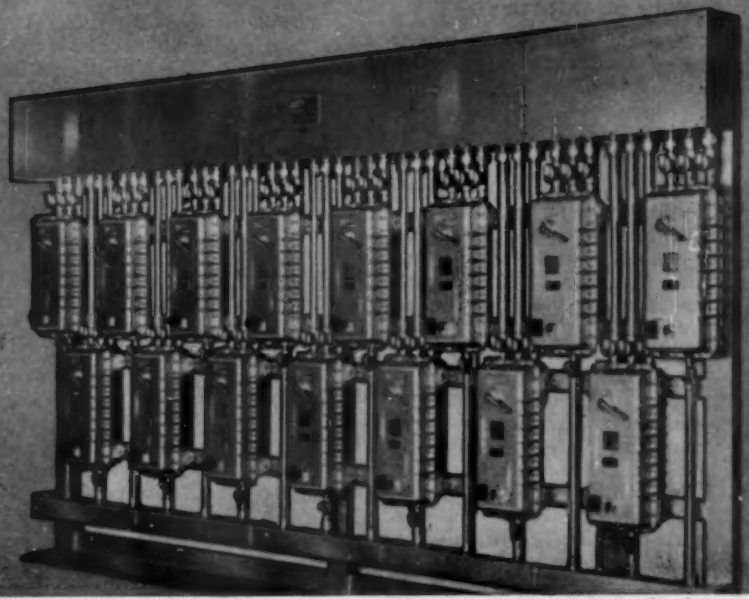
The Killark line includes hundreds of aluminum conduit fittings, plus light fixtures, pilot light stations, flush switch boxes, instrument boxes, seal-off fittings, cord connectors, flexible couplings, splice boxes, plugs and receptacles, entrance fittings, and many other kinds of enclosures for hazardous and non-hazardous locations. Killark wholesalers can supply the correct item for any need, in the exact size needed—and do it promptly *from stock.*

DISCONNECT SWITCHES AND CIRCUIT BREAKERS

Full range of hub arrangements and conduit sizes, fusable or non-fusable. "Quicklag" through "LM" frame.

MOTOR STARTERS

Available in various housing styles to best accommodate magnetic or manual starters. Sizes 0 through 5. Combination starters designed for neat, compact installation. Easy to install... light weight... plenty of wiring space.



Killark PRODUCTS

- Accessories
- Circuit Breakers
- Cluster Lighting
- Connectors:
  - Cord and Cable
  - Threadless Conduit
- Dust Tight Fixtures
- Entrance Fittings
- Explosion Proof Fittings
- Explosion Proof Fixtures
- Explosion Proof Switches
- Fixture Hangers
- Flexible Couplings
- Instrument Boxes
- Junction Boxes
- Motor Starter Assemblies
- Panel Boards (Cast Aluminum)
- Plugs and Receptacles:
  - Explosion Proof
  - Weather Proof
- Round Fittings
- Series "FD" and "FS" Electrolets
- Series "O" Electrolets
- Speedolets (Set Screw "EMT" Fittings)
- Switch Racks
- Unions
- Vapor Proof Fixtures

For more facts circle 576 on Reply Card

PLANT ENGINEERING EQUIPMENT reviewed for your convenience

Edited by M. E. Heniken

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 243-244. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

RADIANT HEAT PANEL has quartz tube elements

Chromalox Type QRP Panels are designed to provide excellent terminal and resistor life and obtain maximum serviceability from the quartz heat source. Uses include paint baking, process heating, railroad car thawing, indoor and outdoor spot comfort heating, others. The compact panels are 1-by-4 ft in size, available in 4- and 6-kw types for 208 and 240 v. The 240-v elements may be connected in series for operation on 480 v. Where large areas of radiation are involved, panels may be mounted horizontally at any angle, end to end, and edge to edge on ½-in. conduit stems; also on metal framework. Each panel has nickel-plated steel grille with high reflecting ability, and has ten ½-in. conduit knockouts. More data in Bulletin PG-104. Edwin L. Wiegand Co.

▲ For details, circle 1 on Post Card

INSULATING FILL is low in both cost and density

Reported especially suitable for use with low temperature liquified gases, Perlox is formed from expanded silica aggregate. It offers maximum thermal resistance at minimum cost, according to manufacturer, yet is safe for most cryogenic applications, including insulating liquid oxygen and liquid hydrogen. An inorganic material, Perlox is both physically and chemically stable and because of its structure and powder form, provides little body for moisture pickup. When settled in place it has a density of only 3 lb per square foot. Temperature limits are from —450 to 1400 F. At —300 F its thermal conductivity is said to be less than 0.10 Btu per sq ft per degree F per hour. Johns-Manville Corp.

▲ For details, circle 2 on Post Card

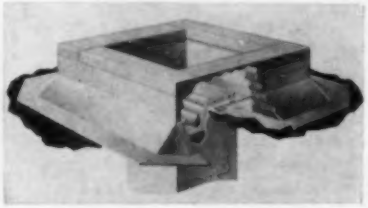
GASKETING MATERIAL for hot oil applications

Armstrong NO784 is a Buna N rubber compound designed to provide better performance at lower cost in hot oil applications up to 350 F. This gasketing material is reported to have a wider range of useful life between low and high temperatures than some of the polyacrylic materials now being used. Armstrong Cork Co.

▲ For details, circle 3 on Post Card

PREFAB ROOF CURB for time and cost-saving installation

Insta-Curb units are heavy gage painted steel with all joints welded. Base and corner cants are said to reduce possible leak points—prevent tearing roofing materials. Features include full fiber glass insulation between



double shell construction, wood top curb for easy ventilator mounting. Each unit is assembled before shipment. To install Insta-Curb, the unit is nailed, bolted or welded down over a roof opening, roofing materials are tacked to the wood top curb and treated, and ventilators, ducts and louvers install quickly and easily. Available to fit roof openings from 10-by-10 in. to 36-by-36 in., with outside top curbs of 20-by-20 in. to 52-by-52 in. Swartwout Fabricators, Inc.

▲ For details, circle 5 on Post Card

MANIFOLD VALVE is three valves in one unit

The P-727 Series Valve is specifically designed for use with differential-type measuring, recording or transmitting instruments in chemical plants, refineries, pilot plants. One variation provides a bleed hole that vents both in-

strument ports to atmosphere when balancing valve is open. Another variation replaces the basic five-valve assembly. Made of brass and 303 stainless, with operating pressures from 0-2000 psi, the P-727 is reported suitable for systems containing air, alcohol, ammonia, argon, helium, hydrogen, hydrocarbons, base oils, natural gas, etc. Because of three valves in one

SPRAYABLE PLASTIC COATING has safety advantage

Pfaudlon 301 is a sprayable coating of Penton in water suspension; it is expected to find wide application because of ease of application, economy and non-hazardous nature. This plastic coating can be applied to desired thickness (20 to 40 mils) with as few as two applications, company announces. Al-

so, it is stated, parts do not require preheating; complex shapes can be covered, and surfaces not requiring the coating can be easily excluded; a superior bond is obtained between metal surface and resin.

Penton, (a chlorinated polyether polymer developed by Hercules Powder Co.,) is said to have almost universal resistance to corrosion at temperatures to 250 to 275 F, and excellent resistance to abrasion and impact damage. To apply Pfaudlon, the surface to be coated is cleaned by sandblasting or other methods; a film of suspended resin is then applied with standard spray equipment; water is driven off and the coating is fused to the metal at 400 to 500 F. Company points out that with the water-spraying technique, elaborate safety measures are not needed to guard against toxicity and flammability. The Pfaudler Co.

▲ For details, circle 4 on Post Card

Cut maintenance costs with Dearborn protective coatings

There's a specially developed NO-OX-ID® or Dearclad® epoxy coating to meet every maintenance problem. They're long lasting . . . easy to apply . . . economical . . . give complete mechanical and chemical protection even under severest conditions.

Specify these scientifically formulated rust preventives . . .

. . . for all structural steel, particularly in corrosive atmospheres
. . . for water tanks, exteriors and interiors . . . plant piping
. . . for yard bridges . . . all support and post footings
. . . for metal parts and equipment, indoors or out
. . . for running and standing rigging . . . operative cable.

A Dearborn engineer is always available to help with your particular coating problems and to recommend the type of coating best suited to your needs. Call him today.

DEARBORN CHEMICAL COMPANY

General Offices: Merchandise Mart, Chicago 54—Dallas • Des Plaines, Ill. • Ft. Wayne
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Toronto • Havana • Buenos Aires

Send today for free easy-to-use maintenance check-chart. Keep it handy as a guide to make sure your plant's "vulnerable locations" are adequately protected against costly corrosion.

Dearborn Chemical Company
Merchandise Mart, Chicago 54, Illinois

Please send me without cost or obligation your booklet, "Rust Threatens Your Plant," containing the Maintenance Check-Chart.

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COMPANY

ADDRESS

CITY ZONE STATE

YOUR POSITION OR TITLE

pioneer in the science of corrosion control

dearborn

0702

For more facts circle 577 on Reply Card

EQUIPMENT

(Begins on page 166)

body, several fittings are eliminated during installation. According to company, valve is maintenance-free, does not require valve seat replacements or operating adjustments. O-rings set in grooves on diameter of valve plugs are designed to prevent interport body leakage. Circle Seal Products Co., Inc.

▲ For details, circle 6 on Post Card

PAINT STRIPPER can be diluted with water

Speedi-Strip 1030, dilutable with four to 20 parts of water, is an acidic chlorinated solvent stripper used at room temperature. Manufacturer says it is effective on epoxy and other synthetic enamels as well as other modern coatings, and also on plastisols. It strips within 2 to 15 min., (longer for heavy plastisols) and works by breaking the bond, rather than dissolving the paint. It is claimed non-flammable, suited for use with most metals, including aluminum and zinc. The Esbec Corp.

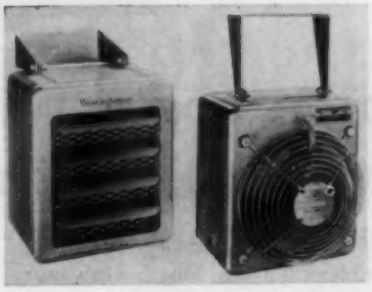
▲ For details, circle 7 on Post Card

HEAVY DUTY LATHE for mill, foundry, machine shop

Model 4025 is announced as a 75-hp extra-heavy-duty engine lathe new in design from the floor up. The headstock provides 36 spindle speeds (5- to 800-rpm range) and 75 hp in all speed ranges. It features a 160 to 1 speed ratio in true geometric progression and cutting speed is automatically calculated, enabling removal up to 180 cu in. of metal per minute. Claimed ca-

pable of handling stock up to 504 in. long with a 40½ in. diam swing over the bed and a 25½ in. swing over the compound, this lathe provides rigidity because of its full width compound and three-dimensional truss design of the bed, the latter enabling handling of torsional loads at full 75 hp. Metric and special leads are available in the totally enclosed and automatically lubricated end gearing, designed at a 1 to 1 ratio. Sidney Machine Tool Co.

▲ For details, circle 8 on Post Card



ELECTRIC UNIT HEATERS in two styles, many sizes

Available in sizes from 1½ to 36 kw with either manual or automatic control, these heaters mount out of the way on a wall or from a ceiling. Manufacturer points out that they provide advantages of electric heating —instant heat with controlled circulating, and elimination of a heating flame—and can be used in a wide range of applications, including freeze prevention and drying processes.

The units come in two styles: 1½ to 7½ kw and 9 to 36 kw. In the smaller ratings, the heaters provide up to 25,590 btu/hr with fan capacity of 380 cfm. Units with larger ratings provide over 122,000 btu/hr with fan capacities up to 2560 cfm. Fan drives are direct connected. Heating element is of spiral design, steel sheathed, and replacable. Fanwheels are aluminum. Each heater has built-in protection, to shut off the unit to prevent overheating. Westinghouse Electric Corp.

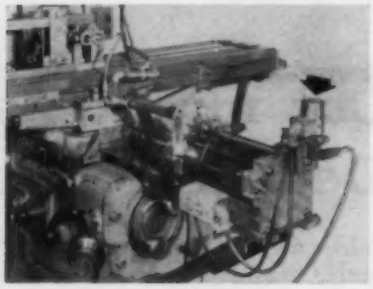
▲ For details, circle 9 on Post Card

SWEEP BALANCE METER measures Btu's used

For accurate assessment of heating or cooling costs on basis of recorded consumption, the Sweep Balance Btu Meter is suggested for chemical processing and other industrial operations. Described as simpler in design than other Btu meters, it requires no amplifiers. It employs electrical resistance thermometers and electro-mechanical computing device. Turbine-type flowmeters are designed to make possible high counting accuracy.

Due to exceptional temperature sensitivity, this meter can be used for cooling systems where the temperature difference is only a few degrees F, company notes, and with it you can even use just one instrument for both heating and cooling with a single system. In this use, heating and cooling measurement would be indicated on separate dials. Available accessories include a remote counter or a strip chart recorder. Air Conditioning Equipment Corp.

▲ For details, circle 10 on Post Card



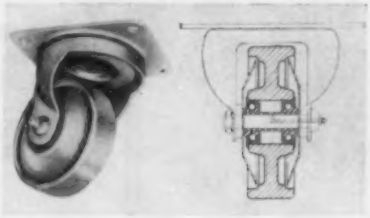
SOLENOID VALVE with a built-in circuit holder

The Crescent Four-Way Valve with built-in circuit holder is designed to simplify wiring by eliminating need for relays and relay circuits. It may be used to control cylinder action on tooling set-ups where reciprocating motions are involved. Illustration shows valve (arrow) installed on a Universal milling machine set up for boring operation on bronze casting. Data Sheet 2082R covers this. Barksdale Valves.

▲ For details circle 11 on Post Card

TEXTILE CASTER designed to prevent lint binding

Two direction protection against accumulation of thread and lint on the wheel axle of this textile caster is said to be achieved by the design of the semi-steel wheel. A step is cast on the web of the wheel so that in addition to the tight fit of the periphery

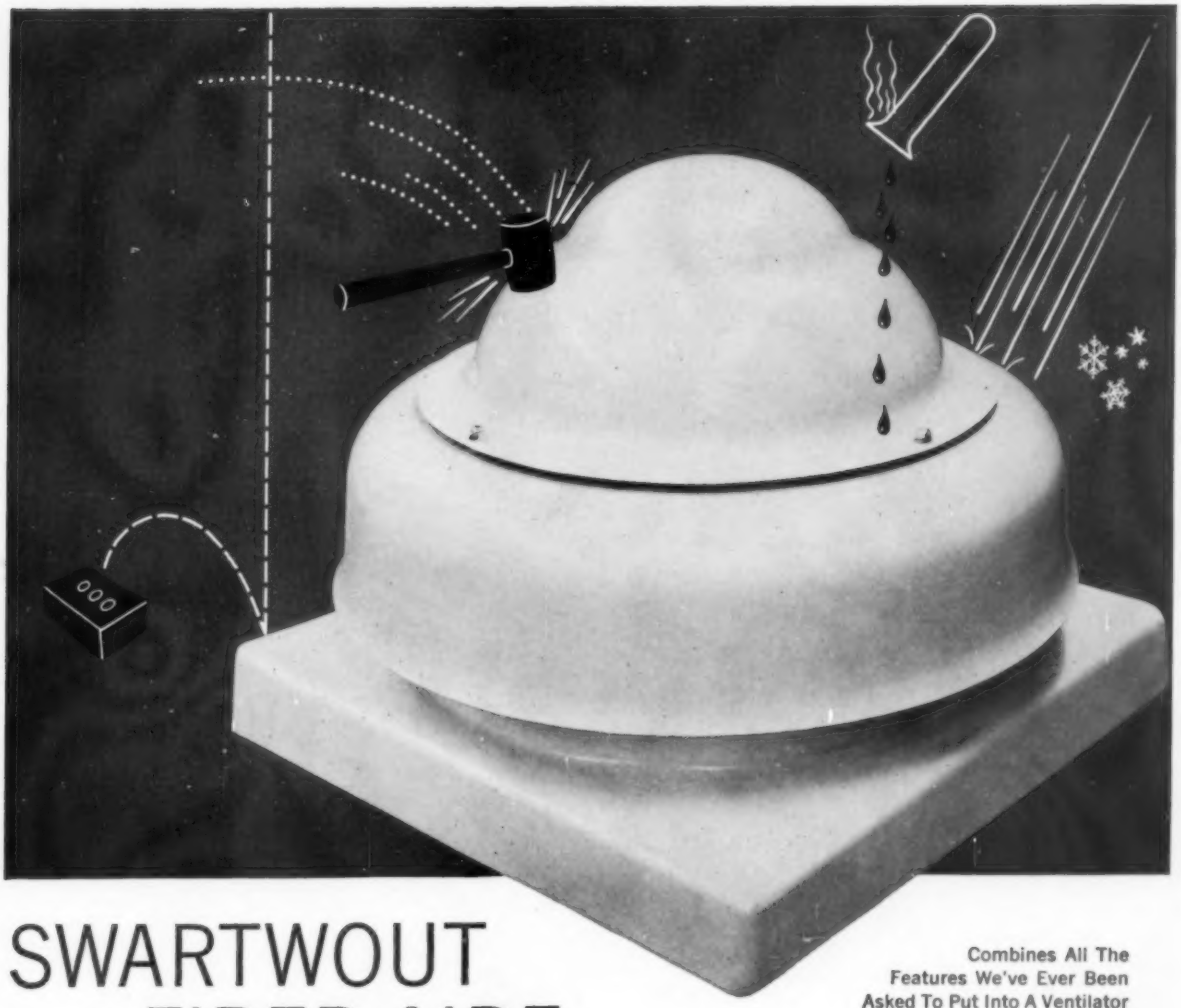


of the thread guard to the concentric inner surface of the wheel tread, there is the right angle protection of the tight fit of the thread guard to the step. The step also serves to protect the thread guard.

This caster is assembled with spacer washers between thread guards and legs. The spacer washer eliminates the common V trap, so that thread and lint will fall freely through the caster fork, says company—but should the thread or lint catch, it can be cleaned out without removing the wheel. Textile casters are also available with all-plastic Lamilon wheels. Both steel and Lamilon wheel casters have ball bearings, come in swivel or rigid types. The Fairbanks Co.

▲ For details circle 12 on Post Card

(More Equipment on page 173)



SWARTWOUT FIBER-AIRE

Combines All The Features We've Ever Been Asked To Put Into A Ventilator . . . At No Premium In Cost!

With Fiberglas* Housing . . . Stainless Steel Wheel

Quiet enough for the president's office yet rugged enough for the toughest plant conditions.

Indestructible — tough, resilient Fiberglas housing is virtually impossible to dent, crack or break . . . impervious to most chemicals, weather, salt spray.

Low initial cost — in spite of its many exclusive features and highest quality materials and construction, Fiber-Aire costs less than many other ventilators with fewer advantages.

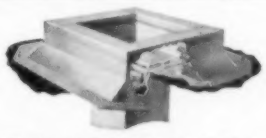
Low operating cost — new design stainless steel air flow guides plus low turbulence throat and outlet give 20% to 50% greater efficiency than most radial discharge centrifugal ventilators.

Low maintenance cost — molded-in color never needs painting . . . Fiberglas insulates motor to run cooler, longer . . . housing can't rust or corrode.

Super-quiet — low turbulence design cuts noise generation . . . all Fiberglas housing actually absorbs noise and vibration.

"Invisible" color — molded-in SX-100 sky-blue color makes Fiber-Aire almost impossible to see against the sky . . . actually becomes more blue on bright days and grayer on dull days. Leaves roof lines clean and attractive.

Available in Direct Drive and Belt Drive Centrifugal and Direct Drive Axial Models . . . 180 to 13,150 C.F.M.



Optional Prefabricated Curb

Swartwout "Insta-Curb" speeds installation . . . assures correct mounting . . . provides long-lasting, low-cost, custom-made curb for Fiber-Aire units.

Free engineering service plus complete information on Swartwout's full line of power and gravity ventilators available on request. Write or call today.

* TM — Owens Corning Fiberglas Corporation

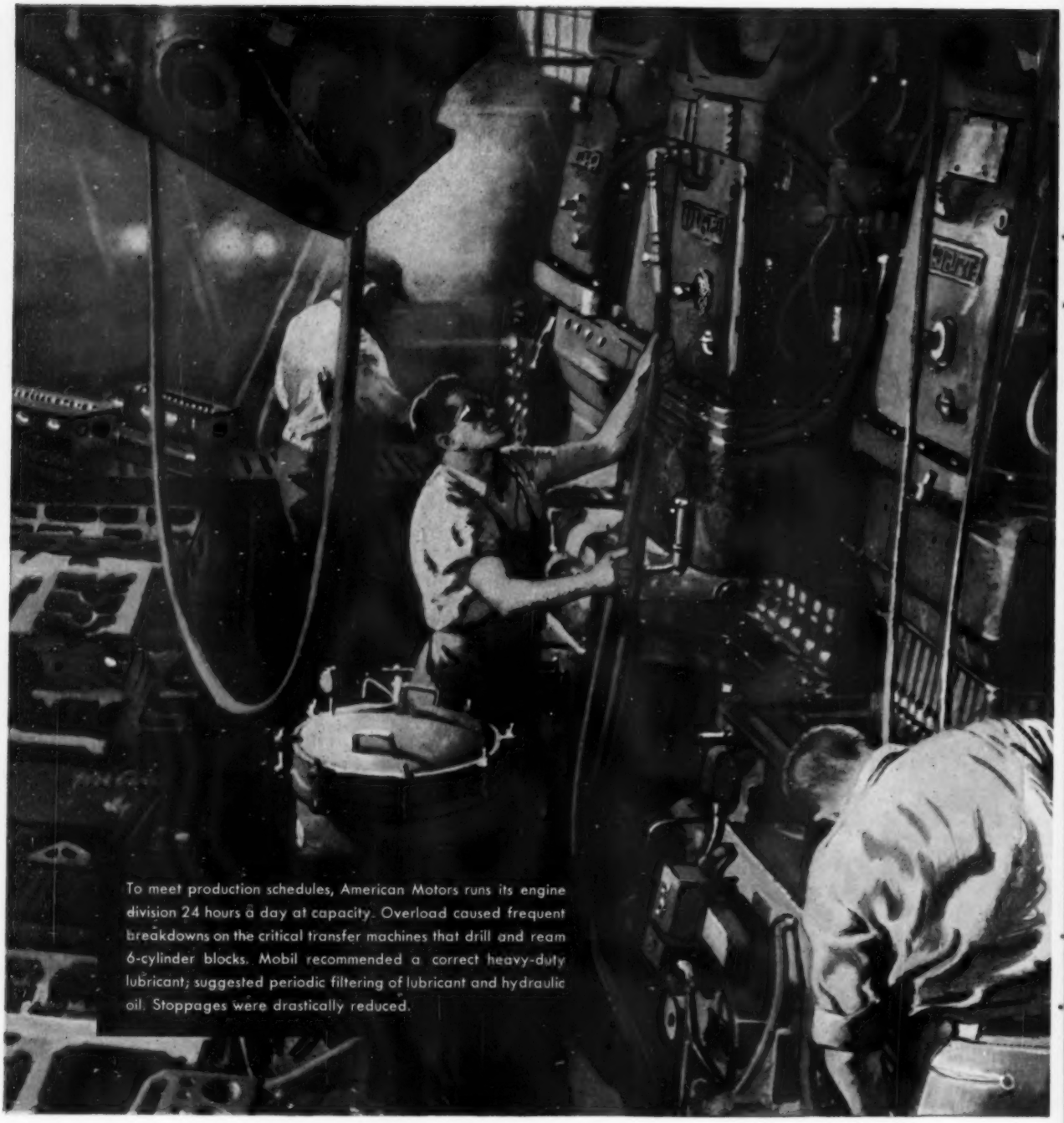
Swartwout **SWARTWOUT**
Fabricators, Inc.

Kokomo, Indiana

In Canada: Eastern Steel Products, Ltd., 8 Bermondsey Rd., Toronto, Ont.

For more facts circle 578 on Reply Card

How Mobil helps American



To meet production schedules, American Motors runs its engine division 24 hours a day at capacity. Overload caused frequent breakdowns on the critical transfer machines that drill and ream 6-cylinder blocks. Mobil recommended a correct heavy-duty lubricant; suggested periodic filtering of lubricant and hydraulic oil. Stoppages were drastically reduced.

Mobil Correct

Motors set production records

American Motors Plant at Kenosha, Wisconsin, fills increased production demands . . . reduces downtime . . . cuts labor and material costs

"The popular demand for Rambler Automobiles has resulted in sharply increased production requirements for our division. To keep our equipment running at capacity we have worked closely with Mobil Oil Company. This effort has been completely justified and has saved us considerable money."

Anderson

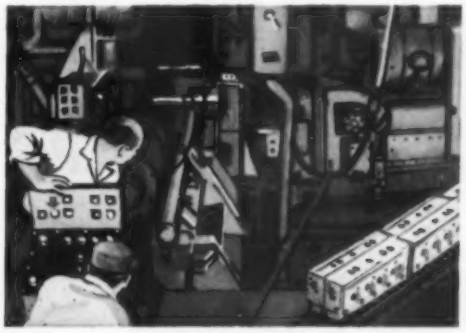
Robert E. Anderson, Superintendent,
Motor Division, American Motors Corp.

Keep 'em coming! That's the order of the day for Rambler Automobiles, and production stoppages can be disastrous. When American Motors' far-sighted management anticipated production demands that would greatly exceed rated plant capacity, they promptly went about making preparations. Mobil was called in to insure correct lubrication for the highly critical production machinery in the motor division.

Mobil engineers, working in close cooperation with American Motors personnel, analyzed the lubrication problems posed by this record output . . . studied other problem areas as well. They recommended correct heavy-duty products, effective preventive maintenance procedures, techniques to reduce contamination and prolong lubricant life. As a result, machine downtime was greatly reduced, production availability sharply increased, and direct dollar savings to American Motors were achieved.

If you are interested in how Mobil may help you solve lubrication problems in your plant, call your nearest Mobil Representative. Or, for an informative, illustrated brochure, write: Mobil Oil Company, 150 East 42nd Street, New York 17, N. Y.

An annual change of hydraulic oil was once the rule for this large machine, which broaches top and bottom of cylinder heads. When Mobil engineers felt that oil usage could be extended, they performed periodic analyses on samples. Tests showed that oil could be used three years.



This "transfer line" machines cylinder heads. Subsequent washing operations were hampered by excessive "soaping" of the cleaner. Mobil traced the trouble to the cutting oil then in use . . . recommended an equally effective, but less costly product that solved the problem.

Lubrication

For more facts circle 579 on Reply Card

Alan Wood Super Diamond floor plate sheds dirt and water quickly

Sweep it, hose it or mop it—A. W. Super Diamond rolled steel floor plate has no pockets to hold dirt or water. The perfectly designed pattern of Super Diamond makes it the easiest-cleaning floor plate on the market today. You can shear, form, weld and match this floor plate wherever necessary, and the unique arrangement of the pattern allows you to bend it any place.

Super Diamond has many other advantages, too . . . an easily matched well-known design pattern . . . and readily available from warehouses. It wears indefinitely, with no chipping, cracking or splintering. And feet get traction from *every* direction, even when plates are wet.

For safety . . . for easy installation . . . for long wear . . . specify Alan Wood Super Diamond. Write for Bulletin SD-S3.

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta
Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle
Montreal, Toronto and Vancouver, Canada: A. C. Leslie & Co., Ltd.

For more facts circle 580 on Reply Card

EQUIPMENT

(Begins on page 166)

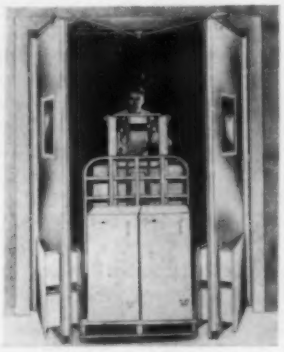
TEMP DETECTOR is dual element, tip-sensitive type

Model 313 is designed to permit measuring the same temperature at two different locations or to permit indication and recording simultaneously. This resistance temperature detector has two concentric elements and, in effect, is two detectors in one housing. Only 5/16 in. in diameter, it can be had in lengths to 10 ft. It is supplied with a spring-loaded holder to press the tip of the detector against the surface being measured. Publication 1045-8 gives data. Thomas A. Edison Industries, Div., McGraw-Edison Co.

▲ For details, circle 13 on Post Card

SHOCK ABSORBER DOOR uses urethane foam buffer

Flexible urathane foam is used as a cushioning material in this shock-absorber door to withstand the constant poundings caused by trucks and



dolleys. Nopcofoam, a urethane foam manufactured by Nopco Chemical Co. is used as a buffer between door surface and shock absorber panel. It offers resiliance, load distribution, imperviousness to oils and greases, resistance to fire, fungus and mildew. The Clark Door Co.

▲ For details, circle 14 on Post Card

BUTYL RUBBER COATING extends life of asphalt roofs

U. S. Royal Coating has a base of butyl synthetic rubber. The fade-resistant colors are formulated with aluminum pigments to improve the roof's ability to reflect heat by 15 per cent, and says manufacturer, the coating is waterproof, won't chip, crack or peel. Tests are reported to indicate that asphalt shingle roofs treated with it last 10 to 15 yr before needing further attention. The coating is applied with an ordinary paint roller to a roof

INCREASE PRODUCTION

with New SUN-X Glass Tinting

Now you can economically protect your employees from the dangerous, fatiguing effects of the sun's strong rays... provide comfortable working light... and help prevent mistakes and accidents.

New Sun-X Glass Tinting, a liquid plastic development by Du Pont, makers of "Better Things For Better Living... Through Chemistry," gives you positive, all-day sun control. Laboratory tests prove conclusively that Sun-X can eliminate up to 95% of the light rays causing glare.

New Sun-X Glass Tinting is applied quickly and neatly to your existing windows by a unique miracle-flow process. It bonds tightly and is *guaranteed in writing* not to chip, crack or peel. No maintenance is required — you wash Sun-X tinted windows in the usual manner.

Available in your choice of 11 distinctive colors, Sun-X Glass Tinting gives you the distortion-free appearance, the trouble-free convenience of expensive factory-tinted glass *at a fraction of the cost.*

To see how Sun-X can more than pay for itself in increased production, send now for your free copy of "Solve Sun Problems with Sun-X."

Manufactured by Du Pont — INTERNATIONAL DISTRIBUTORS

AMERICAN GLASS TINTING CORPORATION

DEPT. O • 4125 RICHMOND AVENUE • HOUSTON, TEXAS

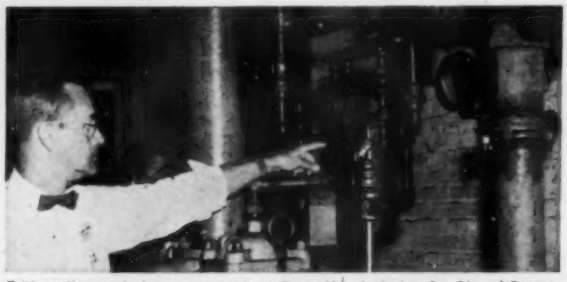
For more facts circle 581 on Reply Card

SARCO TOPICS

How to save water and prevent over-cooling of compressors, small engines, and hydraulic oil-coolers

When cooling water is controlled manually the operator frequently leaves the valve nearly wide open, in order to play safe if the load varies. The result is over-cooling. If he attempts to vary the flow of water he risks the danger of under-cooling. Automatic cooling controls assure proper cooling at *all* times and effect important economies in water consumption.

And here are three different experiences at Revere Copper and Brass plants which may give you some tips on solving your own cooling control problems.



T-44 cooling control on compressor at Rome Manufacturing Co. Div. of Revere. Sarco sales representative Emile Strickland points to control installations.

How Revere Copper & Brass Saved over 50% on water

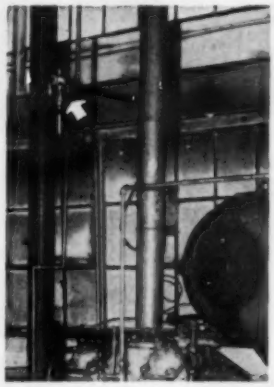
Sarco T-44 automatic cooling control installed at Revere's Riverside plant.

The Riverside, California, plant of Revere Copper & Brass was plagued by over-cooling of compressors. In addition, their water consumption was high — approximately 2,000 gallons an hour. By simply installing Sarco T-44 automatic cooling controls on the compressor cooling lines, plant engineers eliminated over-cooling and cut water consumption about 60%.

Another benefit was a saving in tool maintenance. (Originally excess moisture was causing difficulty with a large number of air screwdrivers used in the plant.) With the T-44's in service the maintenance problem has practically disappeared.

Manual control was wasting water at Rome Manufacturing Co. Div., Rome, N. Y.

At the Rome Manufacturing Company Division of Revere, at Rome, N. Y., cooling water for air compressors originally was manually controlled. When they installed Sarco T-44 automatic cooling controls on the cooling water lines they made substantial savings in water. They saved damage and maintenance cost on the compressors, too. That's because they eliminated the errors inherent in manual control. Automatic cooling controls always assure optimum cooling by permitting safe operation at the maximum temperature recommended for any given machine or process.



Installation of a Sarco T-44 on compressor at Rome, N. Y.

Water conservation program at Baltimore led to automatic control

Double target of engineers at the Baltimore plant of Revere was a water conservation program plus tighter temperature control. To achieve both objectives they installed Sarco automatic cooling controls on an air compressor, an aftercooler and a hydraulic oil cooler.

Results were so satisfactory they followed through by installing 50 additional Sarco controls.

For more information on cooling control, contact your Sarco Sales Representative, District office, or write — 2169

SARCO

SARCO COMPANY, INC.
525 MADISON AVENUE NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

For more facts circle 582 on Reply Card

SARCO

Inside story on automatic cooling control

Simple, gadget-free design, Fully modulating. Sensitive liquid-filled thermostat gives you uniform movement of valve for each degree of temperature change, at all points on the range. Packless — no stuffing box — no leaks — no valve stem jamming. Self-contained — no part of mechanism exposed. Dependable and inexpensive — thousands in service. So reasonable in cost, you can afford Sarco automatic cooling controls for every application.

Sarco T-44 self-powered cooling control is available in standard 50° adjustment ranges: 60-110° F., 85-135° F., 110-160° F. and 135-185° F. Sizes: ⅜", ¾", ½" and 1".

For the full story on Sarco Cooling Controls...

contact your Sarco sales representative or district office, or write—

2168

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.

EQUIPMENT

(Begins on page 166)

surface that has been brushed clean. On an upward swing, the roller forces enough coating under asphalt shingles to rebind loose edges. The coating comes in green, red, white, blue and brown, costs around $6.00 a gallon. Company points out that one application does it, and a gallon covers approximately 100 sq ft. United States Rubber Co.

▲ For details, circle 15 on Post Card

DRY-TYPE TRANSFORMER for indoor installation

These general purpose, ventilated, dry-type transformers in ratings three through 50 kva, single-phase, 600 v and below are designed specifically for indoor use. Three-piece case has convenient knockout locations to permit

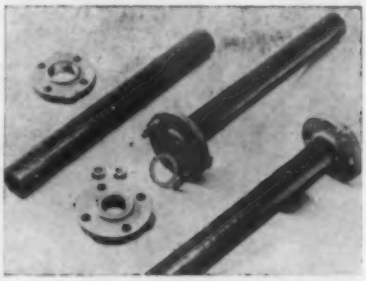
standard size conduit to be connected from either side or bottom. Coils are wound with high temperature epoxy film insulated wire. Large cooling ducts are made for long life and adequate overload capacity, and isolated core and coil unit is designed for quiet operation. Shipped assembled, transformer is claimed ideal for spot load center applications where critical voltage must be maintained for efficient operation of tools, appliances, lighting. Allis-Chalmers Mfg. Co.

▲ For details, circle 16 on Post Card

Reader Service Post Cards for requesting more details on products described are provided on pages 243-244.

FURANE PLASTIC PIPE resists chemicals, installs easily

Eonite is announced as particularly suited for use in processing and transferring of acids, alkalis and solvents. Manufacturer says it is easily installed, strong, dimensionally stable and can carry hot corrosive liquids and gases at temperatures to 300 F, at pressures to 150 psig. Due to streamlined design, smooth bore and its hydrophobic property, Eonite permits increased flow rates—reportedly 20 per cent greater than steel pipe of the same size. It may be sanitized by steam or chemical



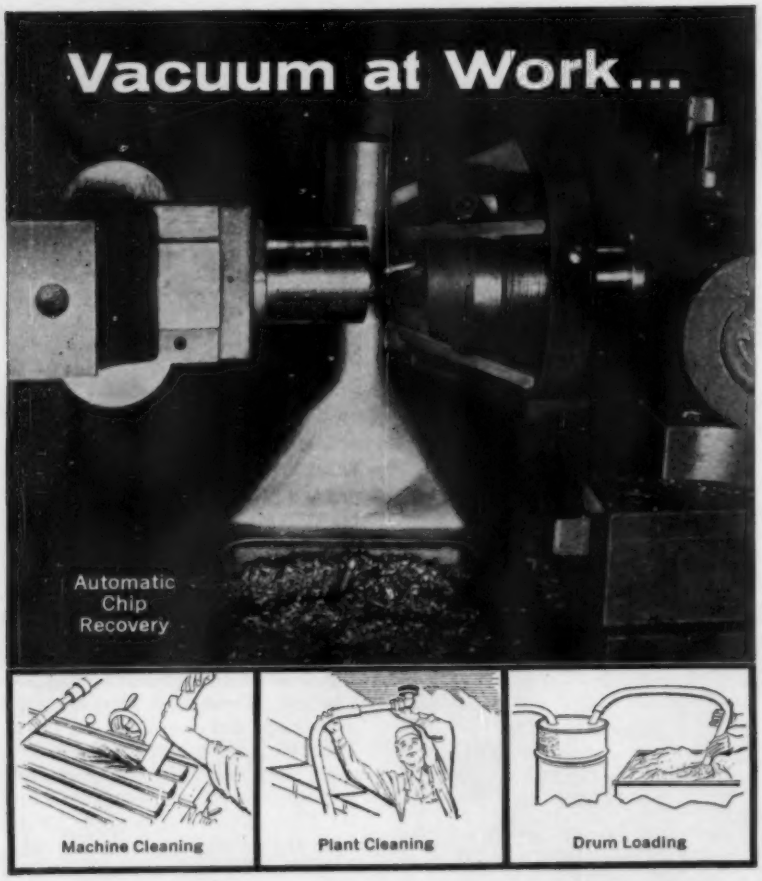
sterilization. This pipe is also claimed immune to fungus or bacterial attack, to withstand weathering and not deteriorate with age.

Made of Durez 16470, a furfuryl alcohol resin, Eonite pipe does not soften or sag with heat, it is noted, and requires support only for pipeline weight. It is assembled with company's ring lock joint which includes two cast iron standard ASA flanges, two 4-deg tapered rings, and a hard asbestos gasket. The pipe comes in 15-ft. lengths in seven sizes with wall thicknesses from 5/16 to 9/16 in. and from 2 to 12 in. ID. Ells, tees and reducers are available. Depending on size, prices range from around $3.50 to $15.50 per foot. Cornelius A. Rauh & Associates, Inc.

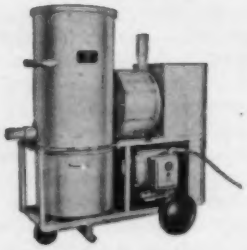
▲ For details, circle 17 on Post Card

DRY LUBE STICK for cutting tools, sliding surfaces

Molykote Lubricating Stick is an extreme-pressure molybdenum disulfide dry lubricant in stick form, resin bonded for greater strength. It permits easy application of a lubricating film to cutting and shaping tools, sliding areas of small and medium size machine parts, or wherever metallic dry friction occurs on sliding surfaces. To apply, just rub the stick over the cleaned surface. The stick is also suggested for use on small surfaces where oil cannot be used because of contamination, temperature restrictions. The stick can



INVINCIBLE Units May Solve Your Problem!



Flexible Invincible vacuum equipment recovers, reclaims, processes, conveys. It will handle metals, liquids, lint, gases—virtually anything that can be passed through a vacuum line.

Vacuum created by Invincible units may be brought to the point of application on wheels or through pipe. Portable machines can be taken off production work during off periods and used as vacuum cleaners, thereby controlling health, fire and explosion hazards.

Capable of continuous operation, rugged Invincible equipment has solved hundreds of production problems, reduced costs and simplified the design of automatic machinery. Over 150,000 Invincibles are currently in use . . . 5,000 are in their 35th year of service.

There are 28 different standard Invincible models, plus special machines and other combinations, ranging from ½ to 10 H.P. More than 50 years of experience in vacuum application are available. Resident engineers in principal cities. Accurate free surveys can be made on short notice.

Write us for detailed information concerning *your* problems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

For more facts circle 583 on Reply Card

EQUIPMENT

(Begins on page 166)

even be formed in desired size for use as an element in the bearings of small machines, ways and light equipment undergoing oscillating movements. The Alpha-Molykote Corp.

▲ For details, circle 18 on Post Card

TWO-RATE RECTIFIERS are versatile battery chargers

Hi-Lo Chargers are two-rate type, economical and versatile to use with most types of stationary batteries. They can be used with six- to 60-cell batteries such as those supplying stand-by or intermittent power for emergency lighting, industrial process

equipment, substation control, engine starting. Operating on 110- or 220-v, single-phase, 60-cycle a-c, the charger's electrical rectifying elements convert the a-c directly to the d-c required for charging. All models charge at both high rates (for recharging discharged batteries) and at low rates (for maintaining charge by trickle — or float-charging).

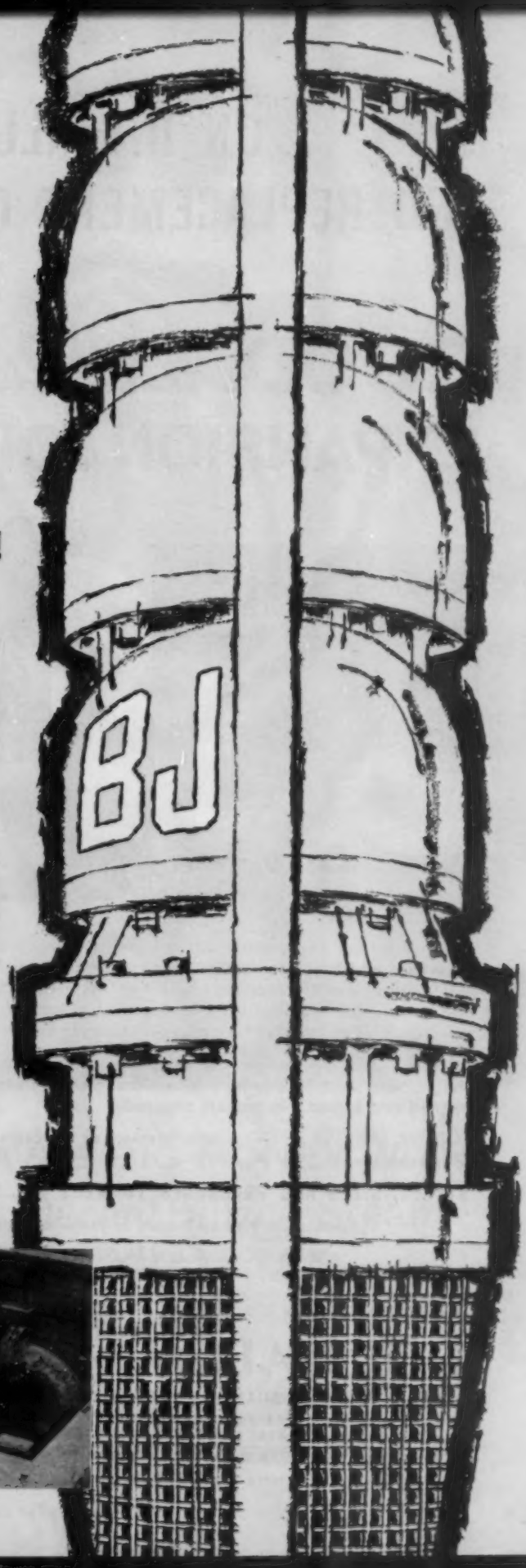
The three smallest of four models—rated at 3 amp for charging six or 12 cells, 15 or 18 cells and 24 cells—have manual high-low switches on the front panel. Major components are door mounted. Rate charging and shutoff are automatic on the largest model, a 6-amp unit for charging 60 cells, with a control comprising a temperature voltage compensating TVR relay and timer. Smaller models can also have the automatic control device in a cabinet. Exide Industrial Div., The Electric Storage Battery Co.

▲ For details, circle 19 on Post Card

CURTAIN WALL SEALANT is improved liquid polymer

Mono Lasto-Meric is a factory mixed liquid polymer sealant for channel glazing, bedding and sealing joints of most panels and lights, as well as for caulking and pointing where better

Quality *costs less* in the long run!



BJ Submersible Pumps

Nowhere is quality more important than in a submersible pump installation where both pump and motor operate down-hole. And that's where BJ quality pays off!

Sealed for life, no adjustments or routine maintenance is required...no noise, no pump house needed, and there is no danger of vandalism or contamination of the well.

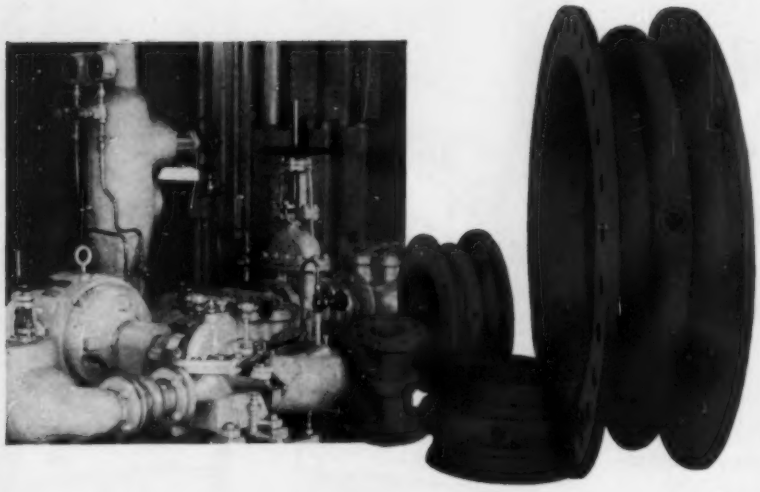
As a pioneer in submersible pumps since 1928, BJ manufactures all three basic components—pump, motor and seal—and offers complete unit responsibility with *the* quality submersible pump. Available in capacities from 20 to 20,000 GPM, heads to 1,800 feet and motors to 450 HP.

BYRON JACKSON PUMPS, INC.
Subsidiary of Borg-Warner Corporation
P.O. Box 70, Lawrenceburg, Indiana
P.O. Box 2017 A, Terminal Annex, Los Angeles 54, California
Offices in Principal Cities

SAVES PLANT SPACE—These 5 stage BJ Submersibles in a covered pump pit use no valuable floor space, yet deliver 1100 GPM against a 203 foot head.

For more facts circle 584 on Reply Card

Save... ON INSTALLATION AND REPLACEMENT COSTS *With* GOODALL *Rubber* EXPANSION JOINTS



Goodall Rubber Expansion Joints are flexible, durable connections for pipe lines and other equipment handling virtually all fluids and gases under pressure and vacuum, to prevent excess stresses due to expansion and contraction; to counteract vibration; and to insulate against undesirable sound. They can also be designed to overcome misalignment.

EASIER TO INSTALL—on new equipment or as replacements. Light in weight, with short face-to-face dimensions. Metal retaining rings quickly aligned and bolted. No gaskets required.

LONGER SERVICE LIFE—no embrittlement or corrosion. High resistance to abrasive wear.

STYLES, SIZES AND PRESSURES TO MEET ALL REQUIREMENTS

Contact Our Nearest Branch, or Write for Catalog

"If it's GOODALL, it MUST be Good!"

Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES. IN CANADA: GOODALL RUBBER CO. OF CANADA LTD., TORONTO.

For more facts circle 585 on Reply Card

EQUIPMENT

(Begins on page 166)

performance and longer life are desirable. It adheres to porous and nonporous surfaces — metal, masonry, glass, wood, etc. — without staining, says manufacturer, and normally no surface priming is necessary. Mono Lasto-Meric is said to retain slight surface tack; to reach its ultimate degree of set and firmness in 2 months without noticeable hardening thereafter. It can be painted, can be tooled after gunning, and comes in a range of colors. With properties similar to higher priced two-part elastomer sealants, this product comes ready for use. The Tremco Mfg. Co.

▲ For details, circle 20 on Post Card

HAND EMBOSSING TOOLS for easy labeling

Dymo Mites are described as hand embossing tools which produce a raised-letter, high contrast durable label on a variety of colored vinyl

tapes with a pressure-sensitive adhesive backing. The tapes can be used indoors or outdoors. Metal tapes are also available. Compact Model M-2 (shown) is 10 in. long, weighs only 26 oz. To use, you dial the letter on the rotating dial and then press the handle to emboss. A built-in trimmer cuts tape to measure. Dymo Corp.

▲ For details, circle 21 on Post Card

SOLENOID VALVE provides automatic flow control

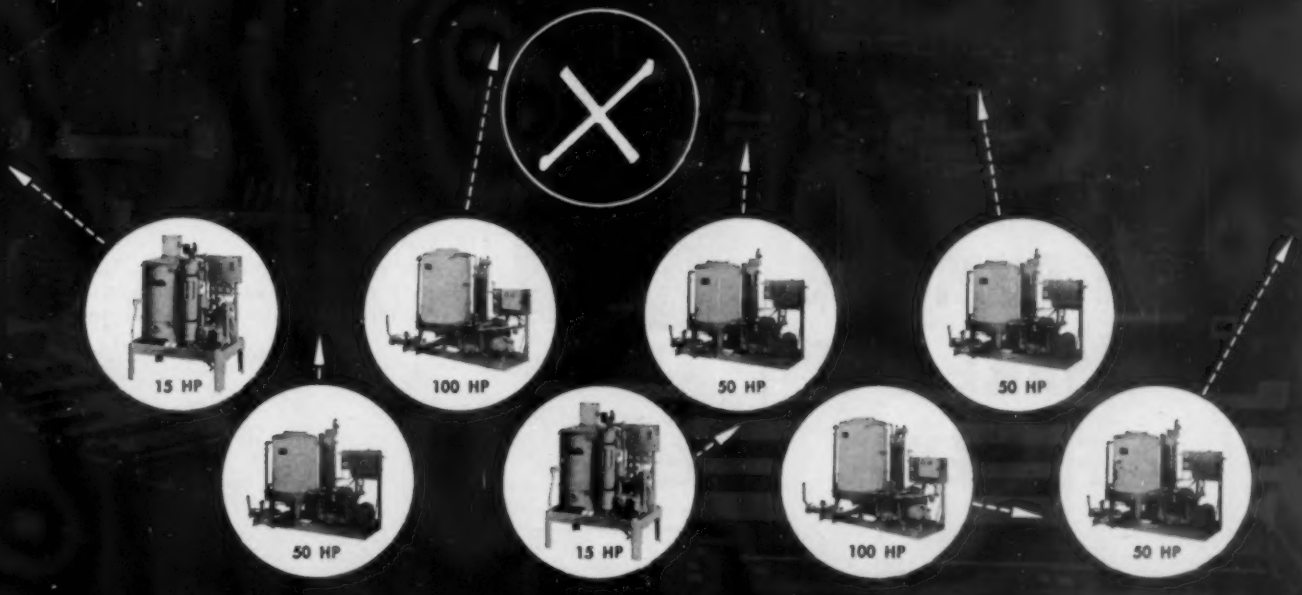
For applications where space is limited, the Midg-O-Matic is designed to provide for accurate automatic control of small flows of water or air. Available in a wide range of voltages and solenoid types, the valve may be secured in angle or straight pattern. It has a range of working pressures to 150 psi, and can have moisture-proof or waterproof solenoid coils. Hays Mfg. Co.

▲ For details, circle 22 on Post Card

LUBE DISPERSION offers optimum stability

According to manufacturer, 'dag' Dispersion 206 is an extremely stable dispersion of colloidal molybdenum disulfied in water; it has unusual ability

Central Boiler Room . . . . . as obsolete as the line shaft



W. P. FULLER & CO. SAVES BIG MONEY WITH CLAYTON'S MODERN Decentralized Steam

Here's how: 8 compact Clayton Steam Generators were installed, each close to a point of use. Total cost—*less* than the cost of replacing just the old steam mains. And by eliminating these inefficient lines, ⅓ of the total HP requirement was saved. Entire central boiler room space was freed for plant expansion. The old 75-foot stack was retired. Fuel savings were 50%. Personnel costs were reduced.

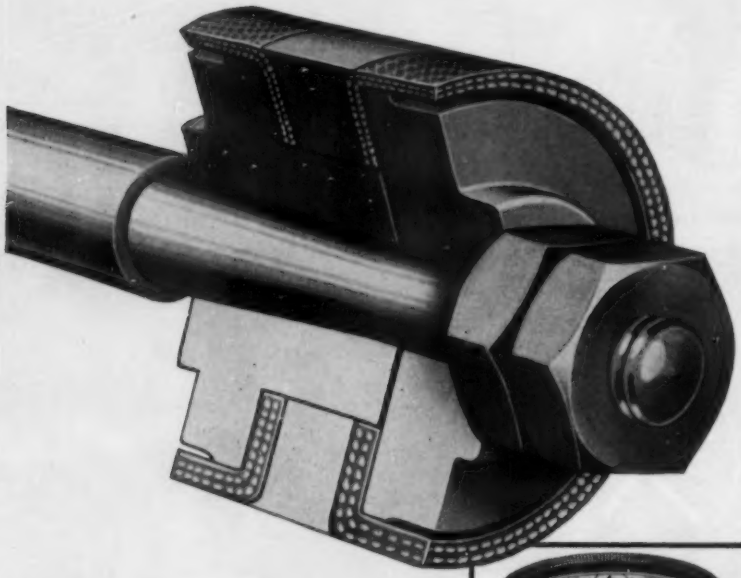
These savings were proven at W. P. Fuller & Co., South San Francisco. All depend on the extreme compactness, fast steaming and operational economy of the Clayton. In your own plant, large or small, decentralized steam savings like this are entirely practical. Write for full information.

420

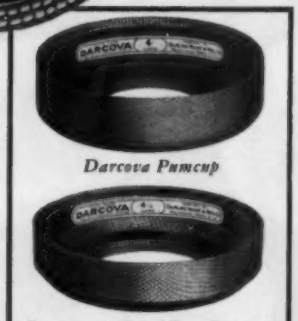
Clayton MANUFACTURING COMPANY

No. Temple City Blvd., El Monte, California

For more facts circle 586 on Reply Card



WHY PUMCUPS MAKE A DIFFERENCE



Darcova Pumcup

Darcova 45° Bevel Type Pumcup

- **in reciprocating pumps**
- **in air and hydraulic cylinders**

With Darcova Pumcups in your cylinders, there's less fluid slippage. High volumetric efficiency is maintained and Pumcups outlast other packings at least 3 to 1! There's less down-time! Lower power cost! Smoother operation! Less maintenance and replacement!

Longer life is the result of truly advanced cup engineering, including 100% nylon composition, plus a choice of types, textures and precision sizes to exactly match fluid, cylinder, pressure and temperature conditions.

These same factors contribute to prolonged high efficiency by permitting full advantage of the "cup principle". Thus fluid pressure always keeps Pumcups snug against cylinder wall, despite eventual wear, while the total frictional load is minimized.

Send for Bulletin 5903. It will give you *all* the facts.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

For more facts circle 587 on Reply Card

EQUIPMENT

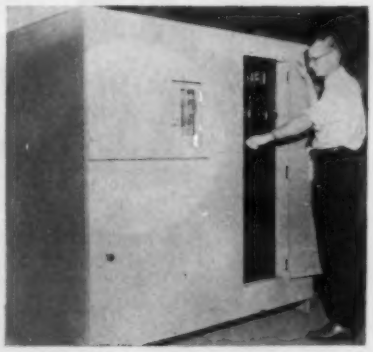
(Begins on page 166)

to resist settling and does not exhibit the tendency to become highly acidic. It is a concentrated material. After dilution with water, it may be applied by spray, brush, dip or swab on preheated metal surfaces, forming an adherent film which provides the high-pressure, high-temperature lubricating properties inherent with molybdenum disulfide. Suggested uses include mold coating, forging lubricant, wire drawing lubricant, stop-off coating, gasket coating, and extreme pressure additive. Acheson Colloids Co.

For details, circle 23 on Post Card

COMPACT SUBSTATIONS take up less floor space

Ultra-compact, packaged electrical substations which slash overall size and floor space requirements by as much as 53 per cent in size, 40 per cent in floor area, are announced. An expan-



sion of company's line of Tranfo-Units, these compact models combine high- and low-voltage control and protection equipment with a dry type power transformer in a single, integrated assembly. They will be virtually off-the-shelf items, available in ratings from 75 through 500 kva. Dimensions are same for all ratings: 75 in. long, 38 in. deep, 70 in. high. Because all leads are front connected, even more space can be saved because unit can be placed against a wall or in corner. I-T-E Circuit Breaker Co.

For details, circle 24 on Post Card

HEAT EXCHANGER MOTORS work in unfavorable spots

Tube-cooled motors, ranging to 2000 hp, are announced in standard enclosed construction for use in nonhazardous locations and in explosion-proof construction with UL Class 1, Group D label for hazardous locations. These air-to-air heat exchanger mo-

ALLIS-CHALMERS

Now — faster, easier hookup with new, 3-piece case design.

All-new dry-type transformers

...on the wall, wired, closed in half the time!

Now 35% smaller, lighter — new Allis-Chalmers ventilated, dry-type transformers feature exclusive 3-piece case that cuts installing time from 90 to *just 40 minutes!* New, compact size opens additional installation site possibilities previously considered too tight for conventional units.

Noise level is reduced to no-hum, whisper-quiet operation by employing core impregnation... by isolating core-and-coil assembly from the case... and by use of nonresonate casing. Low core losses and low exciting current result from superior *Curvacore* construction.

This new 600-volt class indoor transformer line is available in 3- to 50-kva sizes for on-the-site load center applications where critical voltage must be maintained. And the price is right!

Further details are available in Bulletin 61B8222A at your nearby A-C office, or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

Curvacore is an Allis-Chalmers trademark.

A-1359

For more facts circle 588 on Reply Card

EQUIPMENT

(Begins on page 166)

tors are designed to operate in unfavorable environmental conditions, providing protection against excessive moisture, oil vapor, chemicals, alkalies, coolant and air-borne dust, sand, dirt and metallic particles. They are suggested for use on pumps, compressors, fans and blowers, crushers, conveyors etc. Bulletin 2400 gives data. The Louis Allis Co.

▲ For details, circle 25 on Post Card

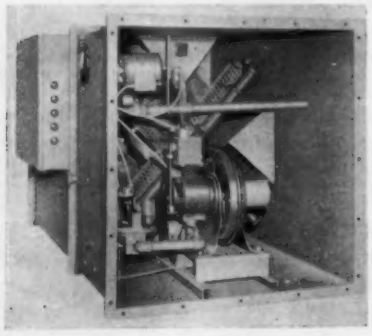
FLOODLIGHT projects bright beam of light

With a vertical beam spread of only 8 deg and a horizontal beam spread of 100 deg, the Lumitor uses the quartz-iodine lamp. This lamp has a service life conservatively rated at 2000 hr, as compared with 1000 hr. for a conventional incandescent lamp, company points out, and it has a mean efficiency of 22 lumens per watt. An aiming device permits accurate aiming of Lumitor's unusual beam pattern. And because the quartz-iodine lamp must be operated within 4 deg of horizontal, a level is built into the housing. The Lumitor comes in 500- and 1500-w models, both with one-piece cast aluminum bodies, deep cooling fins, ¼-in. tempered glass lens. The 500-w model operates on 120 v, has an output of 10,500 lumens. The 1500-w Lumitor operates on 277 v, has an output of 33,000 lumens. Wide-Lite Corp.

▲ For details, circle 26 on Post Card

AIR INTAKE UNITS supply make-up air

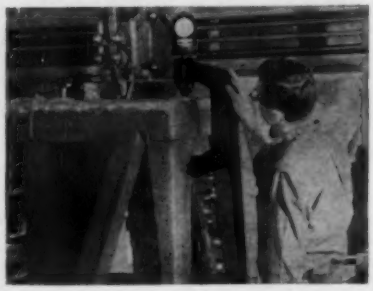
This redesigned line of gas-fired air intake units for supplying make-up air to replace that removed by exhaust systems, covers a capacity range of 15,000 to 90,000 cfm (1,000,000 to 7,000,000 btu/hr.). Basic units include burner, controls and belt or direct driven fan in a single housing . . . and assembled to meet job requirements with accessories including turning elbow, shutters, filter house, and outlet diffusers. Controls can be supplied to meet code and insurance requirements. Hartzell Propeller Fan Co.



▲ For details, circle 27 on Post Card

PORTABLE UNIT does Rockwell hardness tests

For testing metal components and work specimens that must be tested at their position or are too heavy for economical hauling to a testing station, this direct-reading unit can also be utilized in tool departments, maintenance repair shops. It consists of an aluminum clamping device—C-clamps with varying throats—and an indenter



head. The clamps are designed to create a clamping pressure sufficient to hold the unit onto the work piece. These brackets provide a rigid yet lightweight testing instrument. Its minor and major test loads are produced by preloaded springs in an individual spring sleeve. Complete spring units are interchangeable. The tester is available with various clamping designed. Model M-L gives readings in the Rockwell C scale with distance between anvil and penetrator of 0 to 6.3 in. with 3.3-in. throat depth. It weighs 17 lb. Model M-II, also Rockwell C scale, has distance between anvil and penetrator of 0 to 9.8 in. with 5.1-in. throat. Weight is 18 lb. Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.

▲ For details, circle 28 on Post Card

CYLINDER-OPERATED VALVE in more compact design

Space-saving features of the new design of this company's cylinder-operated valves, sizes from ½ to 1¼ in. ID, permit clusters of the valves in remote or restricted spaces and facilitate maintenance and repair. Cylinders have been changed from a pivot mount to a nose mount, eliminating the pivot beam. The unit can be installed in any position for automatic sequence or multiple valve operation. Pneumatically or hydraulically operated cylinders, adjustable to operate at any speed, control process flows with the straight-through, disc-type valve. Remote control by electrical or mechani-

SIX YEARS WITHOUT DRAINING . . .
a lesson in safe hydraulic fluid economy

Since 1954, four 400-ton die casting machines like this one operated continuously on *their initial fill* of Houghto-Safe Hydraulic Fluids. Only make-up was needed to maintain proper fluid level. And each machine operated more than 3000 hours every year.

What better example of the important *extras* you get in *fortified* Houghton Fire Resistant Fluids? In addition to fire-safety, the built-in lubricity, oxidation stability, and corrosion resistant characteristics of Houghto-Safe fluids kept machine maintenance costs to a minimum. Performance was comparable to that of the finest petroleum oils . . . with the added advantage of fire-safety.

Houghto-Safe *fortified* fluids can give your hydraulic equipment and plants this same economical protection. And with it you get completely unbiased hydraulic service from the only manufacturer who offers three types of fire-resistant fluids (Water-Glycol, Phosphate-Ester and Emulsion Types) with compatible packings for any industrial hydraulic service.

FREE! 48-page Handbook of authoritative and helpful information on selection and application of fire-resistant hydraulic fluids and compatible packings. Write E. F. Houghton & Co., 303 W. Lehigh Ave., Phila. 33, Pa.

Industry's Partner in Production

E. F. HOUGHTON & CO.

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For more facts circle 589 on Reply Card

"...our fence definitely discourages pilferage..."

SAYS EAST COAST BOTTLING COMPANY

"When this new soft drink plant went up in the fall of 1959, 700 feet of Anchor Fence were installed at the same time. The architect specified chain link for its durability and maximum protection features. The contractor selected Anchor Fence after competitive pricing. Our Anchor Fence prevents trespassers from short-cutting through the property and definitely discourages pilferage from trucks left in the yard overnight. The sliding gate is very valuable in helping us avoid traffic tie-ups."

Call your local Anchor office today for a talk with one of Anchor's trained sales engineers. Write for free catalogue to: ANCHOR FENCE, 6661 Eastern Avenue, Baltimore 24, Maryland.

ANCHOR FENCE

Division of ANCHOR POST PRODUCTS, INC.

Plants in Baltimore, Md.; Houston, Texas; and Whittier, Cal. • Sold direct from factory branches in all principal cities.

For more facts circle 590 on Reply Card

EQUIPMENT

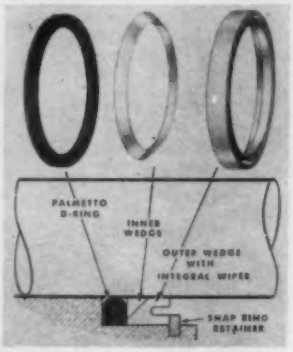
(Begins on page 166)

cal means is available. Valves can be had in bronze, steel, stainless steel, and iron body. Everlasting Valve Co.

▲ For details, circle 29 on Post Card

PACKING SEAL uses double wedge back-up rings

Palmetto D-W Seal combines three elements—rubber D-ring, nested inner wedge nylon ring, and nested outer wedge nylon ring with integral rod



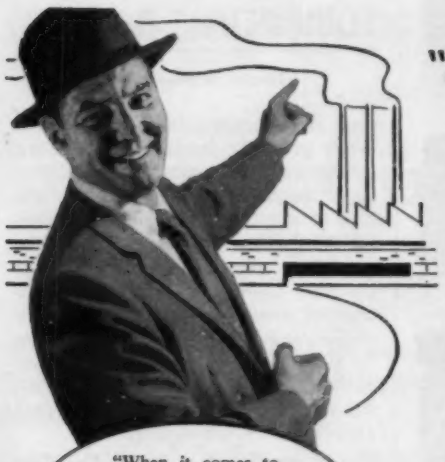
wiper—to provide a compact, low cost seal on reciprocating rods of hydraulic and pneumatic cylinders. D-ring element is available in a range of rubber compounds, and nested back-up wedge rings are made of plastic or metal to meet application conditions. Seal operates with any fluid and at temperatures from —70 to 600 F. and is available in standard sizes for rods from ½ to 3 in. Greene, Tweed & Co.

▲ For details, circle 30 on Post Card

Use the Reader Service Cards provided on page 243-244 to ask for more information on equipment. Circle item numbers of products in which you are interested.

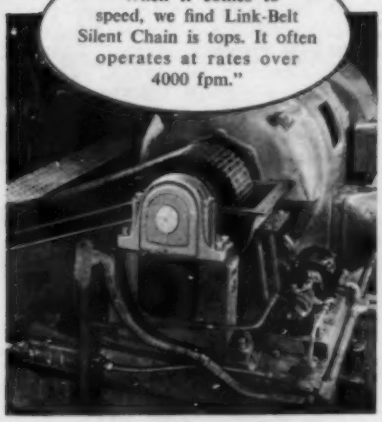
THINNER for use with the RTV silicone rubbers

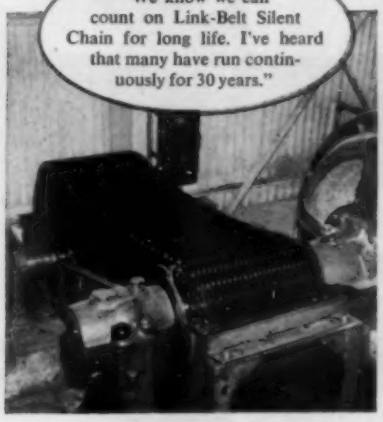
Silastic RTV Thinner is announced as a fluid-like silicone additive for adjusting and controlling the viscosity of RTV-type silicone rubbers. It is said to enable increasing the flowability of uncured RTV silicone rubbers without affecting their performance. Company points out that most RTV silicone rubbers are normally applied as solventless, pourable fluids that vulcanize at room temperature. Major uses include mold-making, forming prototype parts, and a variety of calking, sealing, pot-

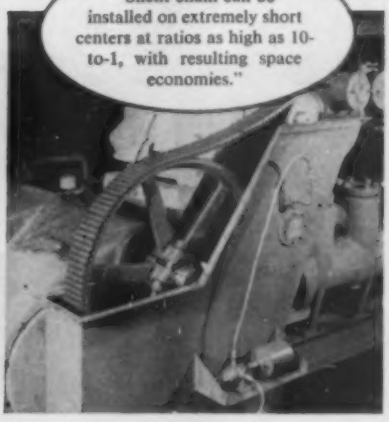


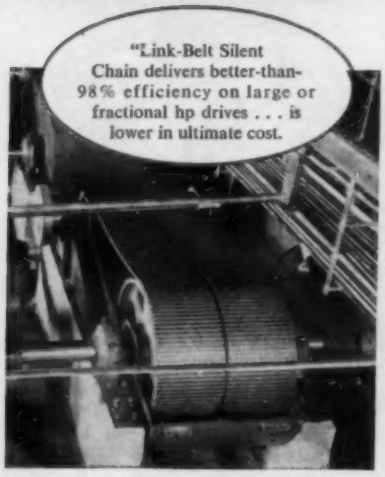
"Join me on a plant tour . . . see why

we're modernizing our drives with Link-Belt Silent Chain"









LINK-BELT

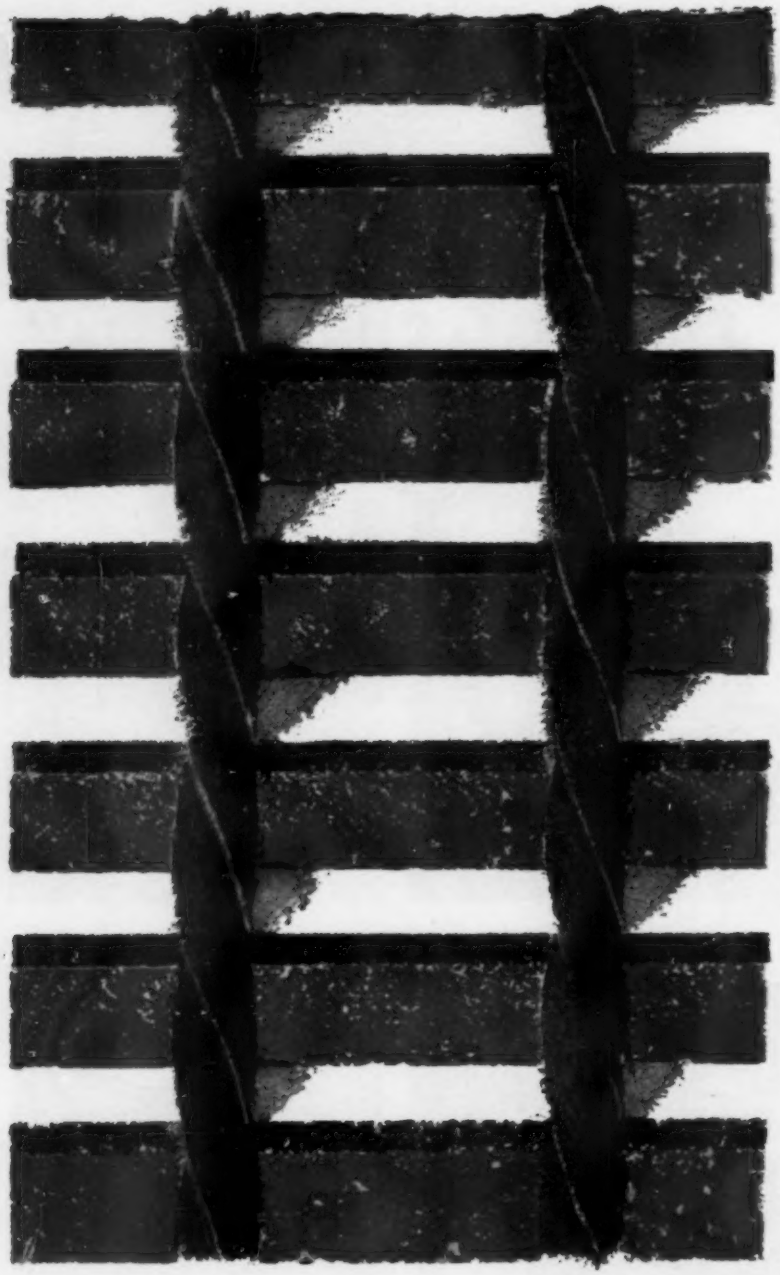
THE SYMBOL OF QUALITY — LB — LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

FULL DETAILS on Link-Belt Silent Chain are offered in 88-page Book 2425. Get your copy from your Link-Belt office or authorized stock-carrying distributor. Look under CHAINS in the yellow pages of your phone book.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo: Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

For more facts circle 591 on Reply Card



Blaw-Knox Electroforged Grating solves so many problems for so many industries. Catalog free on request. Write

Blaw-Knox Equipment Division, Pittsburgh 38, Pennsylvania.

BLAW-KNOX

GRATING

For more facts circle 592 on Reply Card

EQUIPMENT

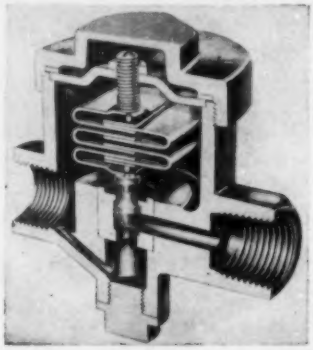
(Begins on page 166)

ting and encapsulating applications. While presently available rubbers are satisfactory for most applications; lower consistency materials facilitate ease of handling in special cases. Silastic RTV Thinner was developed to provide a non-solvent system for this purpose. Using the new thinner, it's claimed possible to reduce the viscosity of Silastic RTV Rubber by as much as 75 percent of its original consistency without significant changes in physical properties of the fully vulcanized rubber. Dow Corning Corp.

▲ For details, circle 31 on Post Card

STEAM TRAP in high and low pressure types

Pressure-balanced thermostatic and float-thermostatic designs are available in this line of low cost traps. They are claimed unaffected by pressure, water hammer, frost corrosion or rough handling. Operation is maintained by a stainless steel, bi-metal



thermal element with universal joints. Resistance to corrosion and metal fatigue is attributed to use of forged aluminum-bronze for bodies and stainless steel working parts. The traps are suggested for a range of applications including superheat service to 500 F. Among uses are heat exchangers, instantaneous heaters, stills, steam radiators, sterilizers, tanks (coil heated), vulcanizing presses, relay points, terminal ends and branch mains. Pressure ranges for thermostatic steam traps range from vacuum to 25 psi to 0 to 300 psi. Catalog FE-310 gives data. MIL Div., Farris Engineering Corp.

▲ For details, circle 32 on Post Card

JOINT SEALER for concrete and masonry

Sealtight Butyl Caulk, produced from polybutane rubber, is a single component material applied directly from the

the main characteristic of every Sorgel dry-type transformer is...

QUIET QUALITY

Still setting the industry's pace for lowest sound levels . . . Sorgel's New 1960 Line features additional reductions in size and weight!

A great many independent authorities agree that Sorgel Sound Rated Dry-Type Transformers have historically been the industry's Quiet Quality line. Biggest human reason why: Men with a desire for excellence make Quiet Quality a crusade at Sorgel. Significant results: (1) The industry's lowest sound level. (2) Unexcelled overload capacity. (3) Unequalled operating efficiency. (4) Long range economy. Proof: Certified tests and case history engineering data, furnished upon request, substantiate Sorgel's Quiet Quality performance. Customer benefits: Complete satisfaction and appreciation.

Sorgel also offers these proven advantages:

- **Lower Copper Loss** — *Coils are liberally designed for the most effective use of the latest developments in insulating materials, have large air ducts for low hot spot temperature and are vacuum-impregnated to provide a co-ordinated insulation system.*
- **Lower Core Loss** — *Cores are designed with the industry's lowest magnetic flux densities, resulting in low core loss and the lowest sound level. Entire unit is secured within a substantial frame. Large units are mounted on vibration dampers to minimize vibration transmission to adjacent areas.*
- **Quicker, Easier Installation**—*The enclosure is self-supporting and entrance can be made on sides, top, bottom, or back. Connecting is made easier by means of solderless connectors on terminal blocks in roomy connection compartments. Units up to 75 Kva single phase and 45 Kva 3 phase are furnished for interchangeable wall or floor mounting.*

The same quiet SORGEL transformers are also incorporated in substations. Procurable with any type or make of switchgear, or from any electrical manufacturer. Contact Sorgel today for the Double "Q" in dry-type transformers . . . Quiet Quality.

1500 Kva, 3-phase, 12,000 volt unit substation with automatic fan cooling system to increase capacity 33%, primary fused load break switch, secondary metering with main fused switch and semi-drawout fusible feeder air circuit breakers.

45 Kva 3-phase transformer with taps. Interchangeable wall or floor mounting. Front panel removed, showing interior.

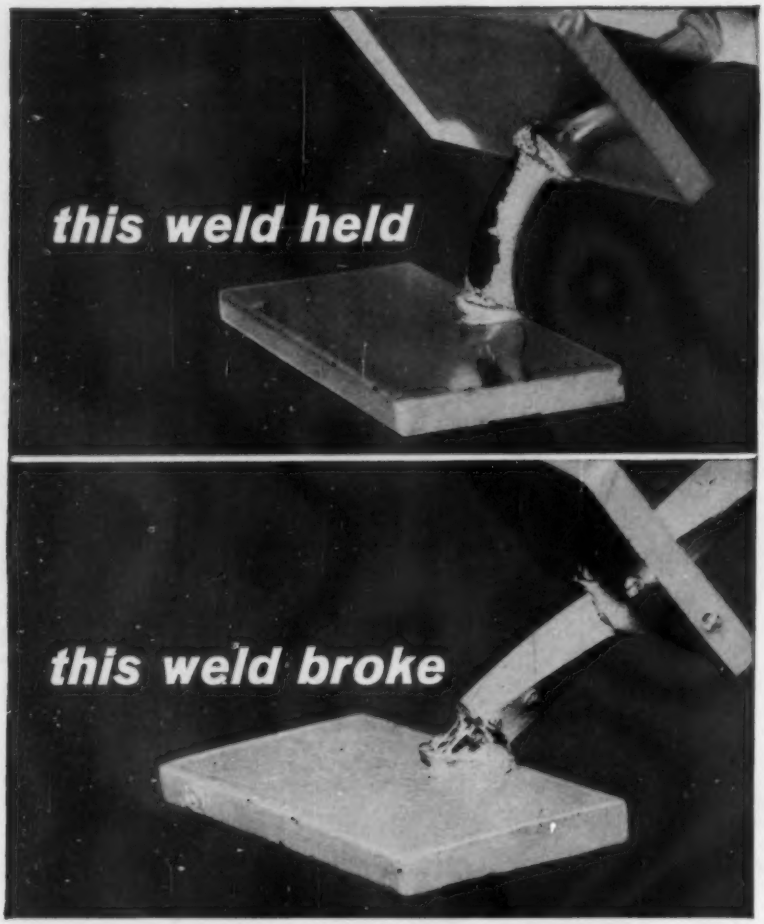
Complete Line for Every Purpose up to 10,000 Kva, up to 15,000 Volts, Including Special Transformers and Saturable Reactors

SORGEL ELECTRIC COMPANY

841 West National Ave., Milwaukee 4, Wisconsin

Sales engineers in principal cities. Consult the classified section of your telephone directory or communicate with our factory.

For more facts circle 593 on Reply Card



(Above) This DRAVO TRU-WELD GRATING was deliberately bent, placing far more strain on the welds than there would be in normal service. Not a single weld has parted. This grating will withstand vibration and hard usage.

(Below) Bent in exactly the same way, this grating came apart at the welds. The fusion of bearing bar to cross bar achieved by the Dravo method of manufacture prevents this from happening to Tru-Weld Grating.

the new stronger grating is TRU-WELD

Tru-Weld grating is stronger because it is *made* that way. Its added strength comes from a manufacturing process that completely fuses the metal at cross bar-bearing bar joints and holds the bars to exact spacing. The result is grating that stands up under excessive vibration, heavy traffic or in areas where corrosive fumes and moisture are a problem. And Dravo Tru-Weld grating *costs no more*.

Complete estimating, layout and fabricating services are available. Immediate delivery from stocks maintained at nearby Joseph T. Ryerson Service Centers will help you meet exacting construction schedules.

For more information on this new, stronger grating — call the Dravo representative in your area, or write Dravo Corporation, Pittsburgh 25, Pa.

DRAVO
CORPORATION

For more facts circle 594 on Reply Card

EQUIPMENT

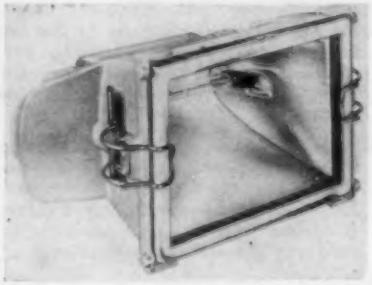
(Begins on page 166)

container. Available in two colors, aluminum or white, it may be applied by gun or trowel. Manufacturer says that it does not require a primer and will adhere to any reasonably clean surface. It is described as soft and flexible offering both adhesive and cohesive properties, virtually unaffected by freeze-thaw cycles and resistant to oil, gasoline, weathering. Claimed non-bleeding and non-staining, Sealtight Butyl Caulk is tack-free in 4 to 6 hr, cures in 30 to 60 days, depending on temperature and humidity. W. R. Meadows, Inc.

▲ For details, circle 33 on Post Card

LIGHTING UNIT gives more light, longer use

Intenso Quartzlite 500, Model G-6000, offers exceptional light control and high operating efficiency due to the iodine cycle Quartzline 500-w, 120-v tubular incandescent lamp utilized, says manufacturer. The unit is reported to produce up to 19 per cent



greater light with twice the lamp life of a conventional 500-w lamp; yet its compact design is scarcely the size of a telephone and the lamp a mere pencil replica. The powerful lamp is also claimed to maintain its 21 lumens per watt output throughout the 2000-hr lamp-life rating. While it performs floodlight functions, the size differential and sharp cutoff in rectangular beam spread suggest many other indoor and outdoor applications, including supplementary high-level illumination. Appleton Electric Co.

▲ For details, circle 34 on Post Card

DUCTILE IRON VALVES offer strength, economy

These ductile iron gate valves are designed for services where cast iron will not meet the operating requirements and steel may be too costly. They are claimed three times as strong as gray cast iron, nearly as strong as carbon steel. Of nodular or spheroidal

For more facts circle 595 on Reply Card ——→

Photo Courtesy Ray Mines Division, Kennecott Copper Corporation

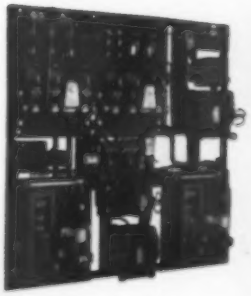
FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING...

IN COPPER SMELTERS: Fast, safe, precision control is essential in a converter aisle like this. This 60-ton P&H crane is equipped with the finest a-c crane control yet designed — P&H Electronic Stepless Control and Magnetorque electro-magnetic braking.

Here, as in every P&H crane installation, P&H engineers have taken all factors affecting performance into consideration. Exact requirements of this converter-aisle installation have been carefully integrated into the overall design.

If this kind of custom engineering makes sense to you for your operation, why not send for more information? Write for bulletin C-42, Dept. 118, Harnischfeger Corporation, Milwaukee 46, Wis.

Heart of the P&H Electronic Stepless Control is this a-c electronic hoisting-lowering control panel. With this modern electronic control on a three-motor crane, as many as 244 electrical contacts are eliminated. Speed-load characteristics of Electronic Stepless Control far exceed any other conventional a-c or d-c controlled crane!



P&H
OVERHEAD CRANES

HARNISCHFEGER
Milwaukee 46, Wisconsin

HERE'S A HOIST WITH A "SENSE OF TOUCH"

This P&H two-speed hoist is perfect for spotting the massive, but delicate, head of a 2-million volt industrial x-ray machine. There's a high speed for quick movement . . . and a slow speed for sensitive, hairline placement. The control is responsive and sure, permitting the operator to literally "feel" his load into position.

P&H Balanced Design Hevi-Lift hoists are engineered to provide just this kind of "no-compromise" performance. Every part of these hoists — including the 24-volt push-button control — has been matched or balanced with every other part for maximum strength, temperature, and performance characteristics. As a result, Balanced Design Hevi-Lifts provide greater accuracy of control under all load conditions, stand up longer under heavier duty cycles — with less maintenance — than any other hoists made today!

Find out more about P&H Balanced Design hoists. Available in standard single- or two-speed models, to fit your particular need. Call your local P&H hoist distributor, or write for bulletin H-55, to Dept. 224, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

P&H
HEVI-LIFT HOISTS

HARNISCHFEGER

Milwaukee 46, Wisconsin

Photo courtesy General Electric Company, X-Ray Department

EQUIPMENT

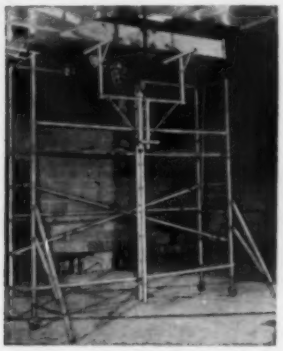
(Begins on page 166)

cast iron content, valves are said to offer higher thermal shock resistance for service on sour crude and other process lines in refineries and tank farms. They are available in sizes from 2 through 12 in., recommended for oil services at temperatures from —20 to 650 F. Crane Co.

▲ For details, circle 35 on Post Card

HOIST ASSEMBLY speeds overhead installation

Mechanical Man, attached to standard scaffolds, lifts and positions materials for one-man overhead installation of fluorescent fixtures, bus ducts, conduit,



pipe and sheet metal work. Material is placed on lifting arms and elevated along vertical track winch of the aluminum assembly. Lifting arms then move horizontally on rollers and elevate material to desired position above workman for fast installation. Up-Right Scaffolds.

▲ For details, circle 36 on Post Card

BUMP DETECTOR for sheet processing operations

This instrument is designed to detect —while the sheet is traveling up to 2000 fpm—such defects as slime spots, bumps, coating lumps, cuts, wrinkles, folds, etc. causing protrusions of as little as 0.0001 in. from the surface of the paper, rubber, plastic, metal, textile and similar sheets. The entire width of the running sheet is inspected all of the time. Operation is automatic and the sensing mechanism won't harm even the softest paper, says manufacturer; also the bump detector is unaffected by variations of moisture or temperature, in the stock or by controlled changes in thickness.

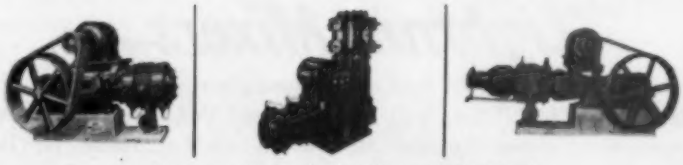
Installation consists only of installing the sensing mechanism across the machine width, and maintenance is easy because plug-in components are used in the electronic section. Each

here's why the simple design of the air cushion valve makes PENNSYLVANIA COMPRESSORS run efficiently...silently...with minimum maintenance.

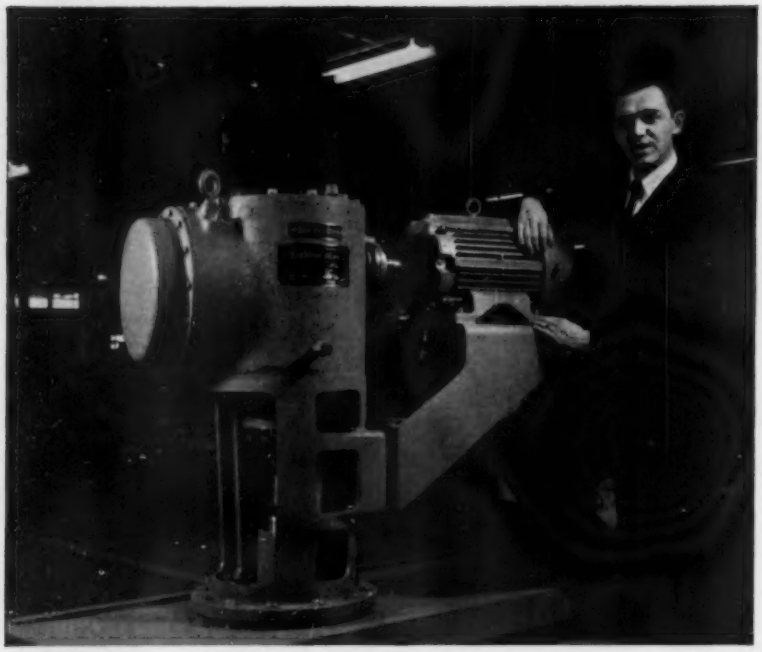
Stainless steel valve discs lift against a cushion of air in the simple, efficient design of the Air Cushion Valve that makes PENNSYLVANIA Compressors run so silently, so dependably, and with such low maintenance requirements. Air Cushion Valves have no nuts, bolts, or screws to break or burn fast. You get longer valve life . . . eliminate wear . . . eliminate noise caused by metal striking metal. Flat valve discs have no flexing or bending action to weaken or distort them. And the valve springs are highest grade stainless steel, rolled on edge, insuring maximum strength and durability. There is just one spring for each disc, and it bears evenly on the entire surface.

But this is only part of the PENNSYLVANIA story. Learn all the facts in "Compressors for Industry". It describes PENNSYLVANIA Compressors from 10 to 350 hp, horizontal, angle, and OILFRE models. Write to Dept. C-8 for your copy today.

PENNSYLVANIA
PUMP AND COMPRESSOR COMPANY
Easton, Pa. • Earning Customer Confidence Since 1920



For more facts circle 596 on Reply Card



SERIES RE comes in a full range of mixer sizes and mountings for open or closed tanks.

NEW LOW-COST MIXER

Here's how to save money on fluid-mixing operations that don't demand the ultimate in shutdown insurance

In new lower-cost Series RE LIGHTNIN Mixers, you get all the advantages of LIGHTNIN construction except for hollow-quill drive. The speed-reducer output shaft is coupled directly to the mixer shaft, rather than through a flexible coupling as in the regular Series E LIGHTNIN Mixer.

Because of this one difference, we DO NOT recommend the new Series RE line for critical operations in which an accidental overload on the mixer shaft could cause a costly drive failure. In such applications, our regular Series E design gives you maximum protection against process shutdown—a degree of insurance you get with no other mixer.

For any job that doesn't demand this high level of protection, you'll find the new Series RE LIGHTNIN Mixer hard to beat on first cost—and on performance.

It's the only mixer in its price range that gives you all these advantages:

1. Efficient right-angle drive—in all models
2. Low-headroom shape—in all models
3. Easy-to-get-at change gears—in all models

Plus: Precision bevel drive gears. Shaft bearings spaced to keep span and deflection to a minimum in accord with AGMA standards. Speed quickly changeable in case process requirements ever change. Splash lubrication throughout. Dry-well leak prevention. Many other refinements such as weatherproof oil-level gauge, weatherproof breather, clear-flow crankcase drain nipple, conveniently placed neoprene-covered grease fittings.

You can get the new Series RE in a full range of sizes, in your choice of *six* different mountings for open or closed tanks, and in literally hundreds of standard power-speed combinations. Wetted parts in carbon steel, 304 and 316 stainless steels are carried in stock.

Get the story now. Ask your LIGHTNIN Mixer representative to show you how new Series RE gives you more mixer than ever for the money—and where you can apply it for greatest savings. He's listed in Chemical Engineering Catalog and in the yellow pages of your telephone directory. Or write directly to us.

Lightnin® Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 144-h Mt. Read Blvd., Rochester 3, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

For more facts circle 597 on Reply Card

EQUIPMENT

(Begins on page 166)

plug-in component has a built-in trouble light to signal any internal malfunction. It is explained that in the event of a sheet break the sensing unit is automatically lifted off the sheet. Princeton Div., Curtiss-Wright Corp.

▲ For details, circle 37 on Post Card

MAGNETIC SEPARATOR is powerful plate-type unit

General-purpose plate magnets in the Series 17 are introduced as a solution to many common problems involving tramp iron and fine iron contamination. The photo shows a 1-in. diam steel ball with actual contact surface

little larger than the head of a pin; it required a pull in excess of 28 lb. to remove from the face plate of a Series 17 magnet, manufacturer points out. And this holding power, extending across the entire width of the unit, is increased where metal objects present a larger surface to magnetic field.

The increased power is attributed to development of an energized Ceramic V magnetic material, Erium 25, which affords a more intense concentration of magnetic strength adjacent to surface of the plate magnets. According to manufacturer, they are quickly installed in chutes, spouts, ducts, feed tables, or over screens and conveyors, and the hinged case and integral handle facilitates periodic removal of iron from face plate. Eriez Mfg. Co.

▲ For details, circle 38 on Post Card

COOLING TOWER for air conditioning, process use

Series 15 Double-Flow Aquatower bridges the capacity gap between this manufacturer's standard line of Double-Flow Aquatowers and unlimited capacity industrial cooling towers, and combines many features of both. Included in the Series 15 design from the industrial towers are: sloping lou-

ACTUAL SIZE

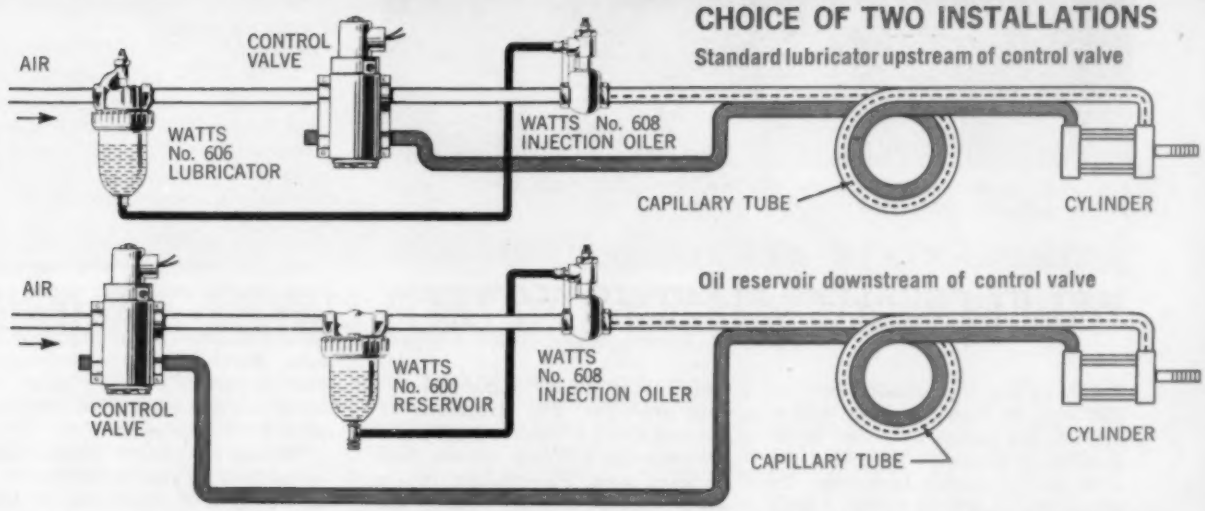
WATTS No. 608

1/4"-3/8"

AIR CYLINDER INJECTION OILER

Solves the problem of lubricating low volume, short stroke cylinders

CHOICE OF TWO INSTALLATIONS



Most low volume, short stroke air cylinders are impossible to lubricate properly by ordinary mist-type lubrication because of their low air consumption.

The solution is *controlled* oiling—*direct to the cylinder*. It's the *only* way to assure positive lubrication for long cylinder life.

Installed in the pressure line between control valve and air cylinder, Watts' new No. 608 Injection Oiler is designed specifically to deliver metered oil direct to the cylinder through a capillary tube located within the cylinder air supply line.

Find out about the Watts Injection Oiler. Available in kit form (K608), includes No. 608 oiler, 2 ft. oil supply hose and 16 ft. capillary tubing.

Write *Watts Regulator Company, Industrial Division, Lawrence, Massachusetts.*

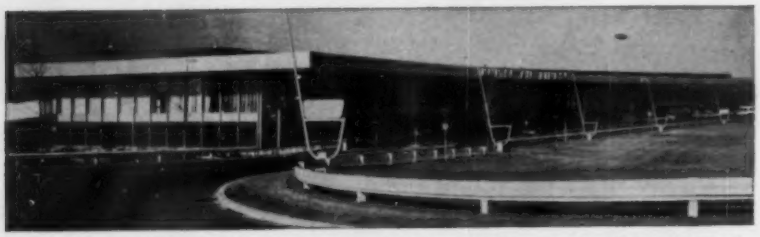
FILTERS
REGULATORS
LUBRICATORS

YOUR SAFE SPECIFICATION

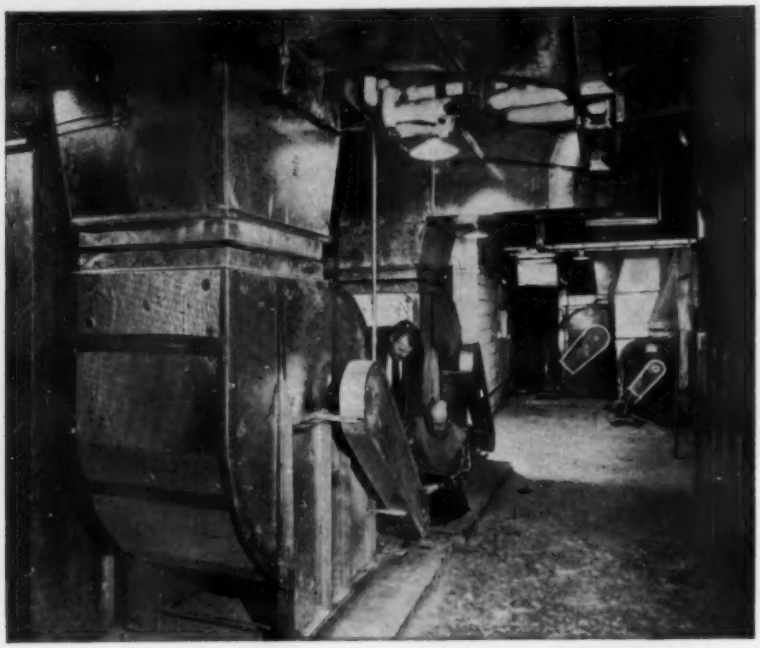
WATTS

For more facts circle 598 on Reply Card

ANOTHER PEERLESS ELECTRIC SPECIAL BLOWER APPLICATION



United Air Lines Terminal Building, Idlewild Airport. Architects: Skidmore, Owings & Merrill. Consulting Engineers: Syska & Hennessy, Inc. General Contractors: Humphreys & Harding. Mechanical Contractors: A. D. Walker & Co., Inc.



Four of the 52 Peerless Electric Blowers. Shown are Philip M. Larkin (left), Senior Project Engineer, and Warren Dorrman (right), Project Supt. of A. D. Walker & Co., Inc.

"COMPLEX AIR HANDLING PROBLEMS MET BY PEERLESS ELECTRIC BLOWERS"

—Philip M. Larkin, Senior Project Engineer

Excessive heat transmission from an 800′ long, 20′ high glass front makes difficult the design target of 78° F maximum summer temperature with 50% relative humidity. In winter the need is for 65-70° F with humidity low enough to avoid condensation. Variations cannot exceed a minus 2% in temperature or plus 5% humidity. And the complete system must serve 45 different areas of the building, including the kitchen.

Tight space conditions and aircraft fumes added to the installation problem. The solution: 52 Peerless Electric Fans to supply and exhaust the 175,000 square foot building area. Peerless Engineers worked closely to make possible the necessarily delicate air balance.

No matter how complex your next job, let Peerless Electric engineer your air moving needs. Write: *Peerless Electric Division, H. K. Porter* Company, Inc., W. Market Street, Warren, Ohio.

PEERLESS ELECTRIC DIVISION PORTER H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

For more facts circle 599 on Reply Card

EQUIPMENT

(Begins on page 166)

ver walls and broad louvers, and glass reinforced polyester filling supports for permanent alignment.

From the basic Double-Flow design the Series 15 utilizes open gravity water distribution system, minimum height in relation to capacity, low pumping head. New components, supplied as standard equipment, include: combined mechanical equipment support and hot water lateral, flow control valves and external lube lines on gear drives. Water distribution arrangement permits several piping options including concealed internal piping and sidewall or endwall risers. Bulletin DFA15-60 gives complete information. The Marley Co.

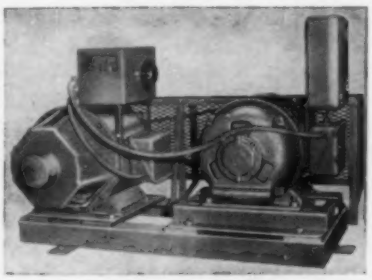
For details, circle 39 on Post Card

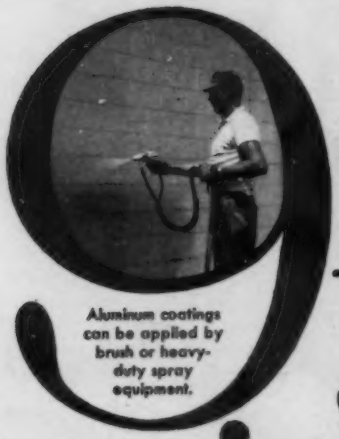
Readers Service Cards on pages 243-244 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

ALTERNATORS produce 360 to 3300 cycle range

For economical high-cycle current beyond the practical range of frequency converters, this line of high-frequency motor alternators includes nine basic models from 1 to 7.5 kva and producing 360 to 3300 cycles. The assembly features a high-frequency alternator; a silicon rectifier unit with time-delay fuses for field excitation; and a drive motor, all on a welded steel base, with removable guard and sliding alternator base. Revolving field construction is used in ratings of 1500 cycles and lower; a brushless inductor type is supplied for ratings over 1500.

Without a regulator, voltage change varies from no-load to full-load by 12 to 18 per cent, depending on rating involved. An automatic magnetic amplifier can be had to hold variation





Aluminum coatings can be applied by brush or heavy-duty spray equipment.

9 year maintenance story

Brightop Aluminum repaints Delaware and Plain City, Ohio, plants of Ranco Inc., a leading manufacturer of controls for refrigeration, air conditioning and auto heaters. Applicator: Bohl Painting Company, Columbus, Ohio. *Brightop, Superbrite* for wood surfaces, and *Uniflex* are made by Acorn Refining Company, Cleveland.

RANCO, INC., RECOATS PLANT WITH BRIGHTOP ALUMINUM PAINT

In 1951, Ranco, Inc., stopped roof leaks and restored appearance of its quonset-type buildings with *Uniflex* Aluminum, a heavy-duty, fibrated coating made with ALCOA® Pigments. Everywhere, on metal, concrete and cement block surfaces, *Uniflex* gave a bright, uniform appearance and waterproof protection.

Recently, Ranco's plant engineer asked the *Acorn* representative to make a routine inspection. *No leaks or deterioration was found.* Laboratory tests of coating sections showed the asphalt base alive and pliant. Over-all, the coating was found to be in good condition, and recoating was not recommended. Nevertheless, Ranco wanted a spanking fresh appearance for 1960. Recommended by Acorn: *Brightop* Aluminum, a non-fibrated paint for metal and masonry surfaces; and *Superbrite* Aluminum Oil Base Paint for exposed wood. Look at the results today.

Good aluminum coatings like these offer the easiest, most economical way to make old buildings look like new—or keep new buildings staying that way. Reflective aluminum pigment turns back 70 per cent of the sun's heat, helps keep interiors cooler in summer. Best protection for exposed metal, coatings like these are also ideal for composition roofing, shingles, stucco, slate and brick.

ALCOA does not make aluminum coatings, but we will be happy to refer you to reputable manufacturers who do. Send coupon today for our booklets.

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and "Alcoa Theatre" alternate Mondays, NBC-TV

Aluminum Company of America
1740-H Alcoa Building, Pittsburgh 19, Pa.

Please send your free booklets:

☐ *Aluminum Roof Coatings Make Time Stand Still*

☐ *Painting With Aluminum*

Name_____

Company_____

Address_____

City_____ Zone____ State_____

ALCOA ALUMINUM

PIGMENTS, PASTES AND POWDERS

For more facts circle 600 on Reply Card

WHATEVER YOUR TRANSMISSION NEEDS

ATLAS HAS THE RIGHT ANSWER

A. S. A. ROLLER CHAIN
MULTIPLE STRAND CHAIN
EXTENDED PITCH CHAIN
CABLE OR SLING CHAINS
ATTACHMENT CHAIN
OFFSET SIDEBAR CHAIN
FLAT-VEYOR CHAIN
SPROCKETS
FLEXIBLE COUPLINGS

Atlas has the right chain for your power transmission or conveying needs. All are unsurpassed in quality . . . pre-tested to give better service. Atlas Chains are made in all sizes . . . in steel, stainless steel, bronze and Electrolized finish.

For complete details and technical assistance on your chain design or maintenance problems there's an Atlas Engineer to help you. Get in touch with your local Atlas Distributor or write direct for details and catalog to Atlas Chain & Manufacturing Company, West Pittston, Pa.

NEW POWER DRIVE CALCULATOR

Technical data for selection of roller chain and sprockets in slide rule form. Available to engineers upon request.

ATLAS

For more facts circle 601 on Reply Card

EQUIPMENT

(Begins on page 166)

with ± 2 per cent where required. Sets usually have a pulley system matched to the desired output frequency, but in applications where several frequency changes are anticipated, variable pitch pulleys or variable speed drives with electric hydraulic, pneumatic or manual control, can be furnished. Industrial Motor Div., Robbins & Myers, Inc.

▲ For details, circle 40 on Post Card

LIGHT, STRONG TANK stores and transports corrosives

Poxyglas Tanks are announced as light in weight and strong as well as corrosion resistant. Non-toxic and odorless properties suggest use in handling products which cannot stand contamination. Tanks may be had in sizes to 12-ft diam. They are produced by a process combining glass-fiber rovings and thermo-setting resins in a precision

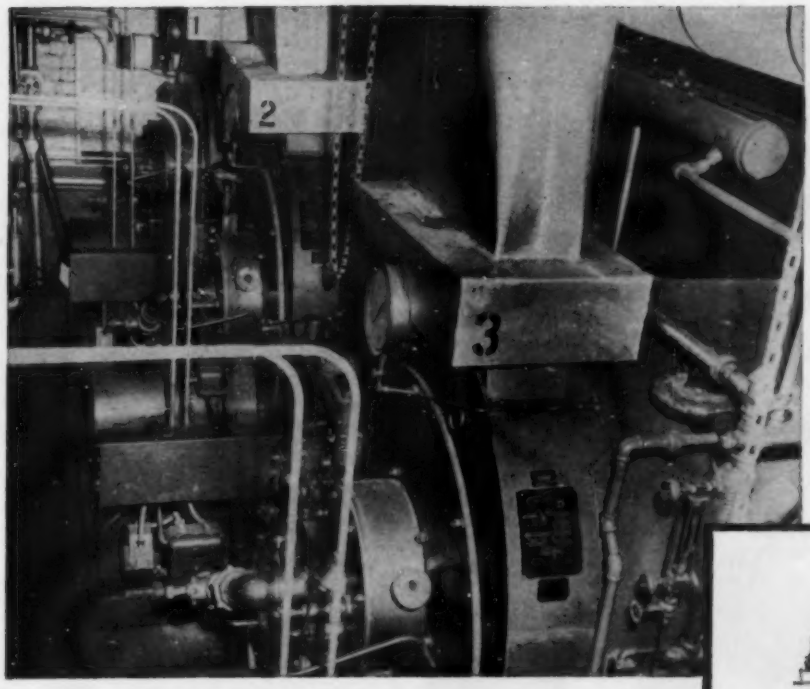
winding pattern. The strong glass filaments (0.000368-in. diam) are wound on a steel mandrel. After desired wall thickness is reached during the winding, Poxyglas is heat-cured while still on the mandrel.

Poxyglas Tanks can be calculated and dimensions certified, company states; structures of continuous filament wound glass fiber construction exhibit strengths up to four times greater than those of conventional reinforced plastic. Shell and head are wound as an integral structure. The shell wall is 0.125 in. thick. Bottoms are molded by a filament-wound mat process incorporating a flange construction for attachment to shell. It is noted that Poxyglas does not have "creep" or "wicking action" properties. The vessels are designed to operate at atmospheric pressure—to stand up to operating temperatures of 250 F. Black, Sivalls & Bryson, Inc.

▲ For details, circle 41 on Post Card

LIGHTING CONTROL has time-delay feature

The Lamplighter (Series 15,000) is a photoelectric lighting control with injection molded plastic cover and base to provide high dielectric strength. A

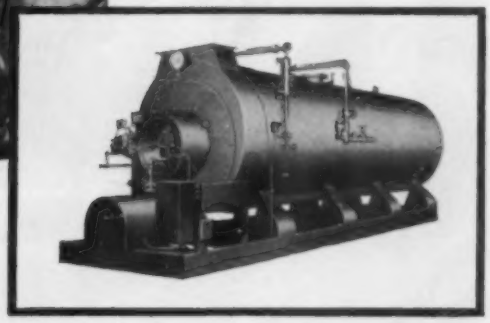


HERCULES-GALION PRODUCTS, Inc., Saves $15,000 Per Year!

Hercules-Galion Products, Inc., of Galion, Ohio, makers of dump truck bodies, ready-mix concrete truck equipment, and steel burial vaults, retired two old style boilers.

To improve heating efficiency, they installed three Cyclotherm 125 h.p. combination light oil/gas package steam generators. The total savings per year comes to $15,000.

As growing production or expanding plant facilities require more steam, Cyclotherms can be added when needed.



CYCLOTHERM

Steam capacity that grows with the plant!

When you recommend Cyclotherm Steam Generators you recommend a steam source that can be quickly and economically expanded to meet plant expansion. For Cyclotherm's wide range of capacities permits the addition of exactly as much new capacity as may be needed at any time. Will 518 lbs. of steam per hr. suit the requirements? That's what a 15 HP Cyclotherm produces. Or are 25,875 more steam lbs. per hour wanted? In that case, a 750 HP Cyclotherm fills the bill. And between these extremes there are sixteen intermediate sizes to choose from.

Compact Cyclotherms are also kind to boiler room space — the Cyclotherm is up to ⅓ smaller than the ordinary package boiler. Installation is easy—no costly stack, no excavation, no foundation. The Cyclotherm is shipped complete — ready to operate. Burner and boiler are built together to work together with *one* manufacturing responsibility back of the entire unit.

Cyclotherm's Cyclonic Combustion guarantees a minimum of 80% efficiency. Larger units operate at from 30% to 100% of rated capacity with no loss of efficiency. Smaller units operate on and off automatically according to load requirements. With simpler design and fewer parts, Cyclotherm reduces maintenance costs by from 30% to 50%. Cyclotherm's world-wide service organization gives prompt service on every call. For full information, write us today.

There are 18 Cyclotherm models, ranging from 15 HP to 750 HP. Burns oil and/or gas. The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of Underwriters' Laboratories, Inc. Guaranteed against any defect in materials or workmanship. Cyclotherm also manufactures a complete line of Hot Water Generators in 10 capacities, from 670,000 BTU per hr. to 6,700,000 BTU per hr.

YEARS AHEAD IN STEAM & HOT WATER GENERATION
CYCLOTHERM®
STEAM AND HOT WATER GENERATORS

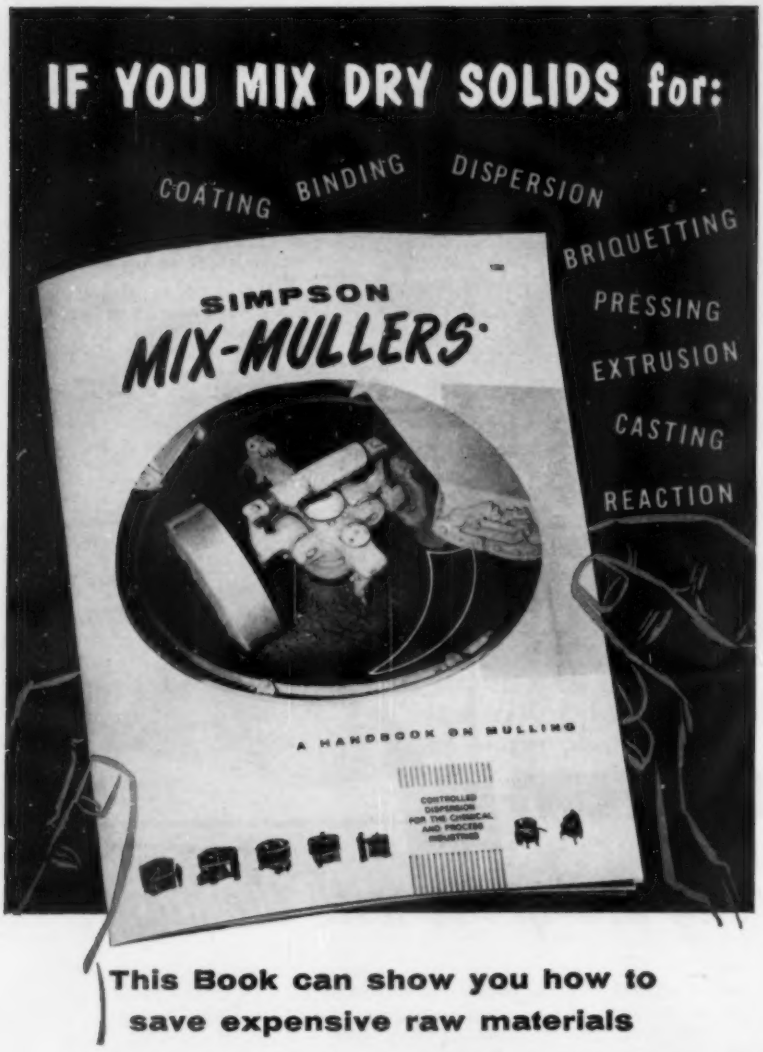
Division of Crane Co.

Clip to Your Letterhead

Cyclotherm
Division of Crane Co.
54 E. First St., Oswego, N. Y.

Please send me your booklet Cyclotherm Cyclonic Combustion, also rotogravure copy of Cyclotherm Sales Steam with illustrations and descriptions of Cyclotherm installations.

For more facts circle 602 on Reply Card



This Book can show you how to save expensive raw materials

If you're coating a fine, dry material, blending liquids into a dry powder, or dispersing a small amount of one material into another, this 12-page bulletin will interest you.

It shows how *controlled dispersion* in a Simpson Mix-Muller can help you make the *most* of today's expensive raw materials by providing an intensive, thorough and homogenous mix that *stays* mixed.

If you're caught in the bind between high material costs, high yield and stringent quality control standards—take a yardstick to *controlled dispersion* . . . write today.

MIXING IS OUR BUSINESS—OUR ONLY BUSINESS

SIMPSON MIX-MULLER® DIVISION
NATIONAL ENGINEERING COMPANY
604 Machinery Hall Bldg. • Chicago 6, Illinois

For more facts circle 603 on Reply Card

EQUIPMENT

(Begins on page 166)

series of exterior ridges facilitates handling and installation, while a twist-lock base, conforming to EEI-NEMA standards, fits standard receptacles. Although a non-fused model is available, Lamplighter offers fuse protection in case of overloading, as well as protection against surges and lightning. Light level, adjustable externally from base, can be set from 1 to 10 fc. Time-delay feature prevents turn-off from light sources such as automobile headlights. The Acme Wire Co.

▲ For details, circle 42 on Post Card

VINYL FANS handle highly corrosive air

Type BT Fans are solid vinyl, belt driven tubeaxial fans in sizes from 16- to 36-in. diam., air delivers to 25,000 cfm. Manufacturer states that all parts in contact with airstream are corrosion

proof, and the entire fan drum assembly is solid vinyl and welded air-tight. Airfoil section propellers may be polyvinyl chloride or coated 347 steel. Bearing assembly incorporates a stainless steel shaft with labyrinth flinger to keep corrosive condensate from the bearings. Propellair Div., Robbins & Myers, Inc.

▲ For details, circle 43 on Post Card

PROTECTIVE PROCESS for brass, brass plated steel

The Lacqua Process involves a simple wetting of the metal surface by dip or other means with a non-flammable water-thinnable material, Lacqua M-800. When used as recommended, Lacqua M-800 is said to show no rainbow or iridescent effect, no blush, and no alteration of metal color. Tests of this corrosion protective system are reported to show that Lacqua M-800 applied to brass-plated steel passed 96-hr salt spray exposure.

Manufacturer points out that this

REWOUND MOTORS, INSULATED WITH SUPER COILIFE, ARE NO LONGER ORDINARY MOTORS

Exclusive epoxy encapsulation adds extra endurance, extra performance, extra life

These extra measures of rewind value—provided by Westinghouse Super COILIFE*—have been conclusively proved. For example, a Westinghouse motor stator, encapsulated with Super Coilife, spent 99 days at the bottom of Great Salt Lake. More than a quarter of this "water" is salt. This same stator was towed underwater by riverboat 1500 miles from Vicksburg to Pittsburgh. Neither of these strenuous trials-by-water had any detrimental effect on Super Coilife.

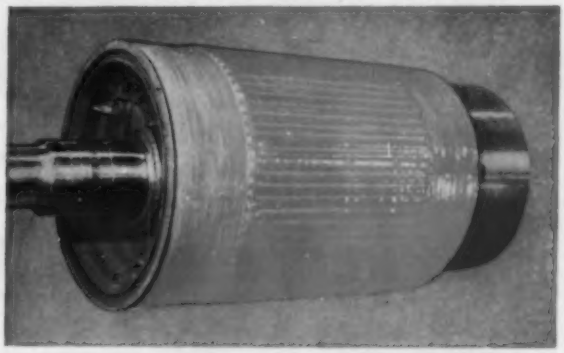
The extraordinary low viscosity of Super Coilife permeates slots and interstices, thoroughly protecting windings inside and out. The specialized application process also provides exactly the right "thin-wall" thickness for each type and class of winding for maximum heat dissipation. Moisture, acids, alkalis, oils and dirt are kept completely and permanently out with this solventless epoxy encapsulation.

Super Coilife has already proved itself in thousands of applications throughout industry such as paper, steel and food processing plants where high humidity is a factor; chemical, petroleum and coke processing plants with critical acid and alkali conditions; mining operations where abrasive matter is a problem; and utilities where fly ash is prevalent.

Super Coilife is an exclusive process of Westinghouse repair plants and can be applied to random wound stators, rotors and armatures. Call your Westinghouse representative for your next rewind job. He will explain the values of Super Coilife and the many other services provided by our repair plants. Write for booklet B-7622, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-95213

*Trade-Mark

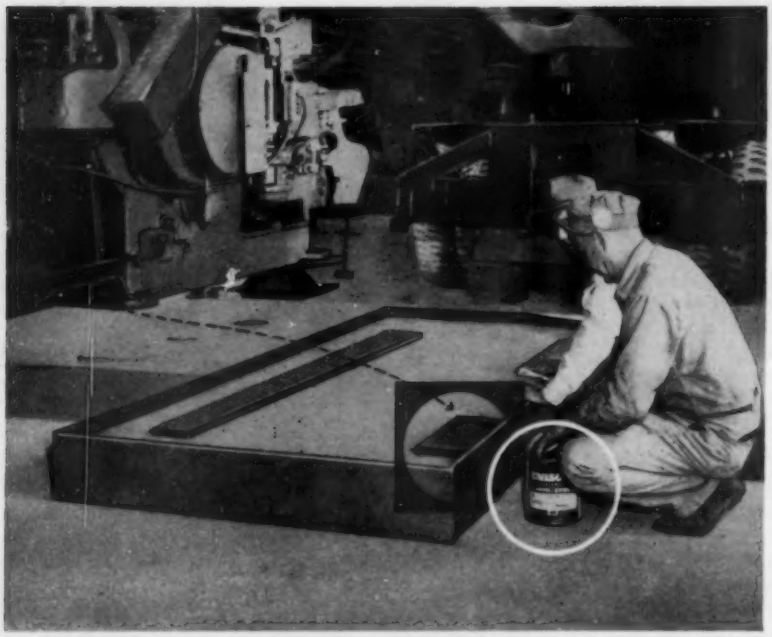
The epoxy encapsulation of this rewound d-c armature offers effective and permanent protection to the windings. Exclusive polyester glass banding is part of the armature rewinding process by Westinghouse.



YOU CAN BE SURE...IF IT'S Westinghouse

Super Coilife insulation was not affected by 99-day immersion in Great Salt Lake, Utah.

For more facts circle 604 on Reply Card



Install Machines / WITHOUT WRENCH, DRILL OR BOLTS with Red Line UNISORB

Whether installing one machine or a whole plant, users report that Unisorb Pads make the job go "slick as a whistle". Here's why:

- Pads are cut to size, buttered with Unisorb Cement, spotted under legs and machine set immediately in place.
- Unisorb Cement has tremendous bonding power, will keep a machine safely in place even under severe side thrusts.
- No hole drilling, bolt alignment or pock-marked floors.

RESULTS...

- Installation costs and time are drastically reduced.
- Absorbs up to 85% of transmitted vibration. Cuts noise, reduces maintenance and improves working conditions.
- Machines can be quickly and easily moved at any time.

Ask about the complete line of Unisorb Mounting Pads with engineered density and thickness for every type machine. Send for special trial offer, NOW. Fast delivery, money back if not satisfied. Sold by leading Industrial Distributors or write direct.

Unisorb Level-Rite is a universal, self-contained leveling mount for all types of machinery. Send for bulletin.

UNISORB 265 SOUTH STREET, BOSTON 11, MASSACHUSETTS

Division of The FELTERS Company New York, N. Y. • Chicago, Ill. • Detroit, Mich. • Upper Darby, Penna. • St. Louis, Mo. • Taylor Felt & Supply Co., San Francisco, Calif. • Acorn Mfg. Co., Los Angeles, Calif.

Please send me a Unisorb Sample and Free Book.

Name.....

Company.....

Address.....

City.....Zone....State.....

PEU-22

For more facts circle 605 on Reply Card

EQUIPMENT

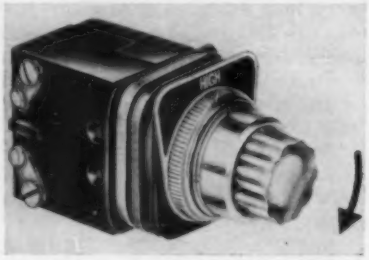
(Begins on page 166)

system also offers savings on insurance rates to present users of flammable coatings. Water wet parts coming directly from a water rinse following the plating operation may be dipped into the Lacqua M-800 as a protective process for brass and brass-plated steel parts. The system is in use for intricately-shaped pieces, large flat areas. Logo Div., Bee Chemical Co.

▲ For details, circle 44 on Post Card

LIGHTED PUSH BUTTON with "turn to test" feature

This lighted oil tight push button offers advantages of a push-to-test pilot light and lighted push button in one space-saving unit. It also provides an instant test to determine if lamp is burned



out. Before pushing the button to start the motor or other equipment, you give the button a half turn. This energizes the lamp circuit without affecting the control circuit and shows whether or not the lamp lights. A similar test can be applied if pilot should go out after motor has been started. As manufacturer points out, this affords safety and convenience benefits especially where equipment is at a distance from control point. Six color caps are available. The Arrow-Hart & Hegeman Electric Co.

▲ For details, circle 45 on Post Card

WET SCRUBBER is compact, economically priced

High efficiency in handling dust, fumes and odors is claimed for the Hydro-Volute Scrubber. Its cost is reportedly 20 to 40 per cent less than previously available hydro-precipitator scrubbers of same capacity. Efficiencies up to 99 per cent on materials as fine as flyash are attributed to scrubbing achieved by vortexing gas flow in a series of chambers, each shaped to produce a swirling action within, so the gas is scrubbed with water and wetted dust particles centrifuged out of stream.

The scrubbers come in capacities from 1000 to 60,000 cfm—the small-

UNRETOUCHED ACTION PHOTOS PROVE SUPERIOR PERFORMANCE OF BUELL CYCLONES

an ordinary cyclone

THE BUELL CYCLONE
with Shave-Off

These are photographs of as true a test as can be made under laboratory conditions. Notice the difference in the dust patterns! In the Buell Cyclone, on the left, the dust at the top makes less than one revolution before it is trapped by the Shave-Off. It's then channeled down to the lower portion of the Cyclone, well below the clean gas outlet.

Why is the Buell Shave-Off so effective? Primarily because it harnesses the double-eddy current to convey the dust "fines" downward quickly, thereby promoting greatly increased efficiencies. In the ordinary cyclone, as shown on the right, these "fines" concentrate and recirculate at the top, causing erosion of the cyclone. To be collected, the fine dust must travel downward close to the clean gas outlet where much of it escapes. Buell Cyclones have made an impressive record in many years of trouble-free service. To see how their extra efficiency in the Shave-Off can pay off for you, send for our Cyclone Catalog #103. The Buell Engineering Co., Inc., 123 William Street, New York 38, New York. Northern Blower Division, 6404 Barberton Avenue, Cleveland, Ohio. (Subsidiary: Ambuco Ltd., London, England.)

buell
Norblo

CYCLONES • ELECTRIC PRECIPITATORS • BAG COLLECTORS • COMBINATION SYSTEMS • FANS • CLASSIFIERS

Life in these excited states...

"Have you seen the pipe inspector?"

How Ace keeps you out of the tight spots

We admire men who jump right into the tough problems, but our business is eliminating problems completely. That is, problems of corrosion and contamination in piping, valves, pumps, tanks, and the like. Good equipment keeps you always in the clear. Our 108 years of experience is at your service.

Ace chemical-resistant rubber-lined steel pipe best for high-pressure, big sizes, or abrasives. Pipe, fittings and valves 1½ to 24".

Highly efficient *WE* pump. Capacity to 360 gpm. Cast iron, fully protected by top quality, chemical resistant hard rubber lining.

Design assistance and facilities for molding special fittings, pump parts, etc., of plastics or hard rubber. Also large hand-fabricating facilities.

Variety and quality to match *any* plastic piping. Riviclor PVC, Ace-Ite rubber-plastic, Parian poly, Ace Saran, Tempron high temperature nitrile, hard rubber-lined steel.

ACE *chemical resistant equipment*
BY **AMERICAN** HARD RUBBER COMPANY
DIVISION OF **AMERACE** CORPORATION
ACE ROAD • BUTLER, N.J.

See ACE equipment in Chemical Engineering Catalog

For more facts circle 607 on Reply Card

EQUIPMENT

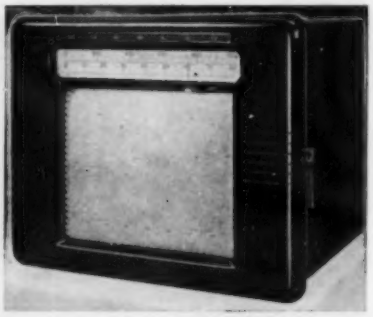
(Begins on page 166)

est about the size of an office file cabinet. Constant or intermittent removal of sludge can be accomplished manually, hydraulically or mechanically, depending on application. Standard equipment on units to 10,000 cfm includes reservoir, liquid level control, moisture extractor and one or more water-tight access doors. Larger units are similarly equipped except that no reservoir is required with a settling pond. The Johnson-March Corp.

▲ For details, circle 46 on Post Card

COMBINATION RECORDER for pressure, temperature

Attractively styled, this electronic potentiometer recorder is self-contained and uses a constant voltage source instead of the conventional standard cell for standardization. It records one or more points of pressure and up to 23

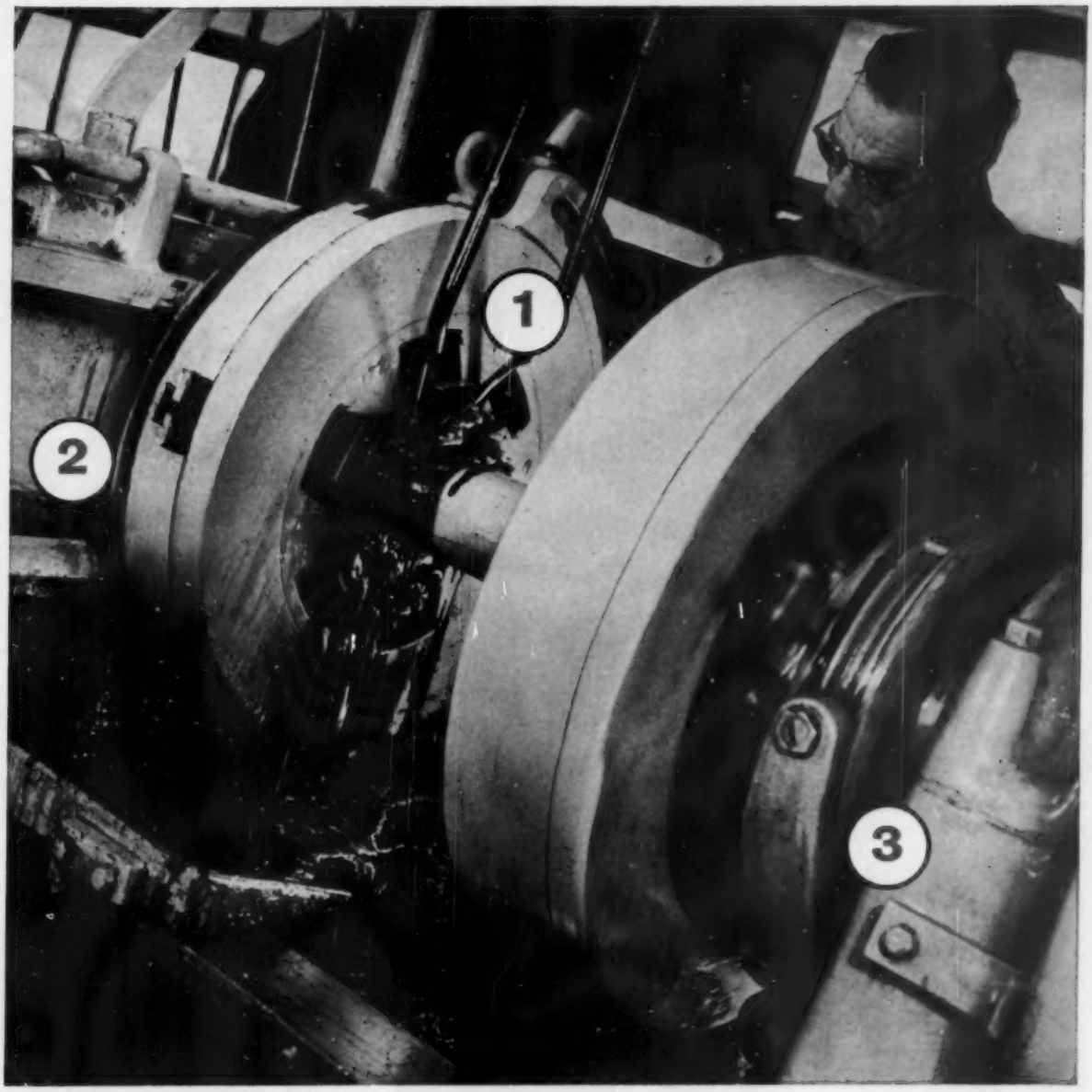


points of temperature. Although developed for use in connection with extruders, in the plastic industry, the flexibility of this recorder suggests other applications. The standard unit has a temperature range of 0-800 F; other ranges are available. Likewise, a variety of pressure ranges are available even though standard recorder has a range of 0-10,000 psig. Zero and span adjustment are provided for the pressure range of the instrument; this is independent of the temperature range. Bulletin F-9789 describes recorder. Wheelco Instruments Div., Barber-Colman Co.

▲ For details, circle 47 on Post Card

DRY SEAL for threaded connectors and pipes

Wrap-It Teflon Tape is for dry sealing threaded pipe joints and cable connectors in hydraulic lines, compressed air lines, vacuum lines, steam lines and corrosive chemical lines. Complete sealing job is done by wrapping tape around pipe threads, company says, with no clean-up around thread necessary. It can be used on a wide vari-



ESSO LUBES HELP BOOST CUTTING EFFICIENCY

1. PENNEX® cutting oils, compounded with fatty materials, are widely used to boost cutting efficiency in threading, tapping and other machining operations on ferrous metals. Featuring high sulfur activity which provides excellent surface finish and low tool wear, Pennex cutting oils have been proven performers over many years.

2. NUTO® hydraulic and circulating oils are inhibited for oxidation and rust protection. They resist foaming and have a high viscosity index for hydraulic uses. They also serve efficiently in gear drives, bearings, and circulating systems.

3. NEBULA® EP multi-purpose grease replaces many single-purpose greases: provides high oxidation stability for long service; lubricates efficiently under high temperature conditions; serves *all* grease-lubricated points, including those where extreme-pressure properties are required.

For further information about Esso lubricants, contact your local Esso office or write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

ESSO

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

For more facts circle 608 on Reply Card

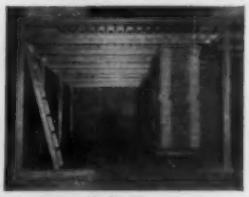
Remember your Erector set?

Think for a moment. Think of all the different things you could make with an Erector set. Then think of Equipto's Slotted Angle — a man's size piece of steel utilizing nuts, bolts, slots and holes. It's a versatile piece of metal that lets you build anything—carts, benches, stairs, racks, scaffolds and many other useful time-saving structures.

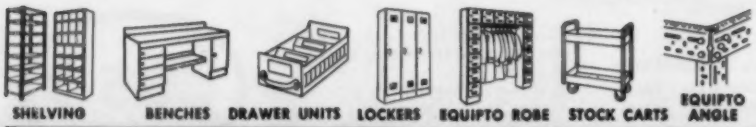
The sheer simplicity of Equipto Angle makes the job of assembly highly economical in terms of manpower—just cut and bolt together. No waste—even small pieces can be used for joints, splices or braces. Temporary structures may be disassembled and material re-used. Hot dipped galvanized for maximum rust prevention — not merely electro-plated but hot dip galvanized.

Equipto Angle is the standard of the industry. **1** Available in either 12 or 14 gauge. **2** Comes in convenient lengths packed 10 angles to a bundle with hardware. **3** Two sizes, 1½" x 2¼" and 1½" x 3". **4** Bolts are standard and interchange with other materials. Why not find out more about this versatile framing material. Write today for your free copy of Equipto Idea Book No. 307.

Double Deck Shelving


Balconies

Storage Racks



Equipto
744 Prairie Avenue
Aurora, Illinois

For more facts circle 609 on Reply Card

EQUIPMENT

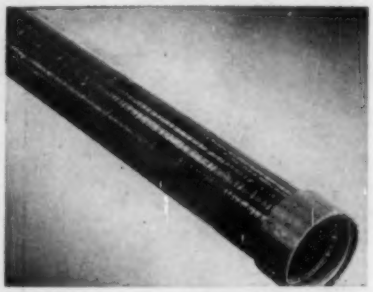
(Begins on page 166)

ety of materials, including steel, iron, plastic, aluminum, monel and synthetic rubber, and is said to have excellent properties for electrical insulation and as thermal barrier. Hitemp Wires, Inc.

▲ For details, circle 48 on Post Card

BITUMINIZED FIBER PIPE comes in large diameters

P. I. Pipe is a pitch-impregnated fiber pipe produced in sizes 4 to 36 in. I.D. and featuring laminated spiral construction. It is designed for all types of low pressure installations, for gravity



flow lines where maximum head does not exceed 20 ft. According to manufacturer, this pipe is strong, highly corrosion resistant, and economical — particularly suited for industrial waste treatment and disposal systems, as well as for venting fumes and gases, for sanitary sewers and storm drains, and for forming round concrete columns in moist sites. Sonoco Products Co.

▲ For details, circle 49 on Post Card

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 243-244.

INSPECTION SYSTEM for items on conveyor belts

The Atronic Inspector is a low-cost, light sensing electronic inspection system for detecting and removing a variety of imperfect items from production conveyor lines. According to manufacturer, it can detect imperfections that create as small as 3 per cent variation light reflected or transmitted from the items inspected. Usable with conveyor belts up to 10-ft. wide and at speeds up to 600 fpm, it is adaptable to many processes. Applications include finding flaws in sheet metals and

This is for YOU!

Shows you why Clarage's airfoil fan tops all others where it counts...on-the-job

Stable high efficiency where it counts — under actual operating conditions.

That's what you *get* (not just expect to get) with the Clarage Type AF Dynafoil Fan...perfected for mechanical draft and heavy-duty applications such as industrial processes, conduit type air conditioning, tunnel ventilation.

Contact our nearest sales engineering office or request catalog on coupon at right.

Clarage Fan Company
Kalamazoo, Michigan

Please send me Catalog 859 describing Clarage Dynafoil Fans.

Name_____

Firm_____

Address_____

City_____ State_____

For more facts circle 610 on Reply Card

Facts of Light!

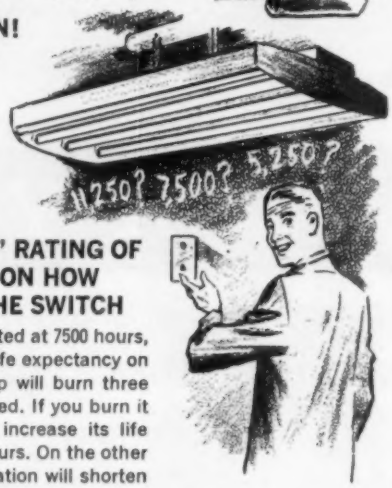
CHAMPION Lamps

TUBES ARE MORE ECONOMICAL THAN BULBS BUT —

For lighting systems in general, incandescent lamps have a relatively low initial cost and a relatively high operating cost. Just the reverse is generally true for fluorescent lamps. In the long run, fluorescent lamps prove the most economical. In the average school building, for instance, fluorescents begin to be more economical in from 3–4 years. However, incandescents would provide the most light for an initial expenditure.

LIGHT BULBS ARE A BARGAIN!

50 years ago a 100 watt bulb cost $1.45. In fact, if 1910 production methods attempted to supply today's demand, a 100 watt bulb would cost about $4.10. Today, you can buy a much better 100 watt bulb for 25 cents list.



THE "7500 HOUR" RATING OF A LAMP DEPENDS ON HOW OFTEN YOU FLICK THE SWITCH

When a fluorescent lamp is rated at 7500 hours, the manufacturer bases this life expectancy on the assumption that the lamp will burn three hours for every time it is started. If you burn it ten hours per start you will increase its life roughly 50% to about 11,250 hours. On the other hand, one-hour per-start operation will shorten its life to about 5,250 hours.

MANY COST-SAVING HINTS IN THE CHAMPION LIGHTING MAINTENANCE MANUAL

This manual explains the principles and advantages of good lighting practice in 48 pages. Included are sections on group replacement of lamps, cleaning programs and a guide to trouble shooting fluorescent installations. This is the latest edition of a guide that has proved to be of great practical value to lighting men everywhere. Write for a free copy.

CHAMPION LAMP WORKS, Lynn, Massachusetts

CHAMPION INCANDESCENT-FLUORESCENT • *YOUR BEST BUY IN LAMPS*

For more facts circle 611 on Reply Card

EQUIPMENT

(Begins on page 166)

plastics; detecting and removing discolored food products from processing lines; marking stains and faulty weaving in textiles.

The system consists of an illumination source over the conveyor, an optical scanner, data processor to

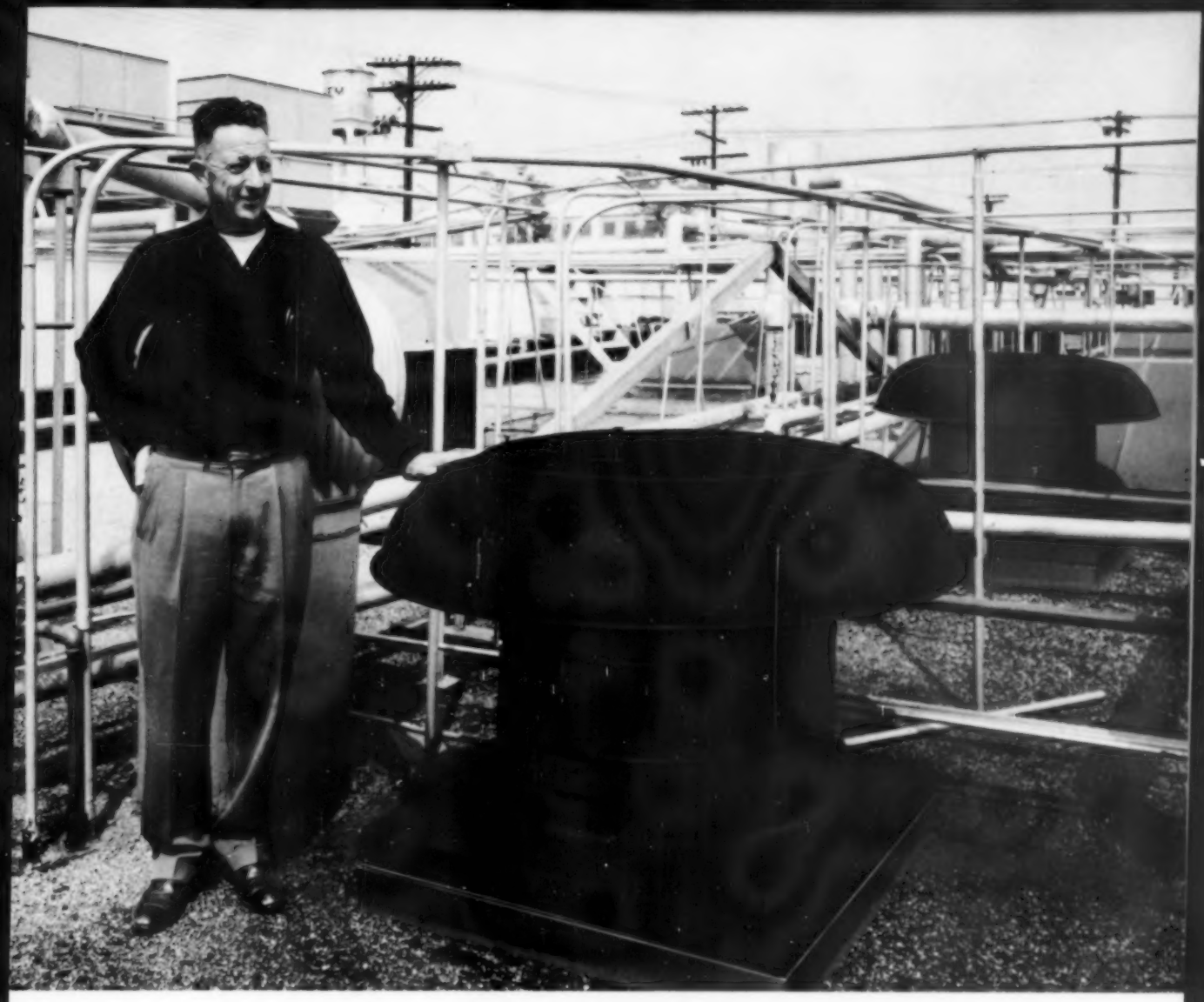
analyze the information, control panel and power supply. Positioned above the belt, the scanner optically scans across the belt 14,000 times a minute. Light intensity signals are then fed into the data processor which converts the light variations to digital forms. These signals energize the actuating device (designed for the particular job) removes imperfect item or marks flaw. Atronic Products. Inc.

For details, circle 50 on Post Card

ALUMINIZED GLOVES resist heat and flames

Designed to reflect 90 per cent of all radiant heat in work where high temperatures are involved, these gloves are suggested for welding and cutting operations, furnace work and similar operations. Backs and thumbs are aluminized asbestos—a combination of asbestos and a heat resistant fabric, Scotch-Shield. Extremely flexible, this material is described as light and fully insulating and not subject to cracking or peeling even under severe condi-

For more facts circle 612 on Reply Card ⟶



"These two Ilg units give us proper vat ventilation"

...Meadow Gold Dairies, Pasadena, Calif.

"We'd have been better off if we'd put in these two Ilg power roof ventilators a long time ago," says John McKinley, plant engineer, Meadow Gold Dairies, Pasadena, California.

"Our problem was to increase ventilation over some vats in our ice cream mix room. We had a centrifugal fan but it didn't handle enough air.

"So we put in these Ilg roof ventilators and solved our problem. They exhaust the steam from our vats plus 'dust' from various powdered ingredients we dump into our mixers.

"Wish we'd talked to your salesman a long time ago."

ILG

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

Here's why power roof ventilators and fly fans satisfy customers

"Ain't No Flies on Us." New Ilg B-15FF fly fans above receiving-room doors at Meadow Gold Dairies solve the fly problem. Powerful down-blast of air forms a protective screen that blocks out all insects.

Low in Height . . . High in Performance. Ilg Type LSQ power roof ventilators feature direct-connected, patented "Q" fan wheels that pass air over blade smoothly, quietly. Low-starting torque of Ilg 3-phase and permanent-split capacitor, single-phase motors eliminates starting shock, lengthens fan life. Eleven sizes for exhausting from 87 to 21,000 c.f.m. . . . at pressures from 0" to ⅝".

"Check-Out" Time. Every Ilg-built Type "Q" fan wheel passes rigid dynamic balancing checks and tests before being direct-connected to Ilg-built totally-enclosed, 3-phase or permanent-split capacitor, single-phase motors. This Ilg Type "Q" fan wheel design is unmatched for quiet, efficient operation.

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.

Offices in 60 Principal Cities

Member of Air Moving and Conditioning Association, Inc. (AMCA)

EQUIPMENT

(Begins on page 166)

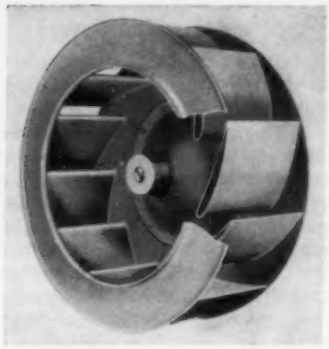
tions. The gloves will come in three styles: a five-finger carpincho leather glove; a one-finger mitten of green heat-resistant leather; and a five-finger glove of green heat-resistant leather. All are available lined or unlined. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

▲ For details, circle 51 on Post Card

AIRFOIL BLADED FANS have improved rim wheel

Featuring a low velocity radial rim wheel design, the Series 116 line of airfoil bladed centrifugal fans is intended for general ventilation and industrial process applications. They come in 15 sizes in both single- and double-inlet designs.

Air entering the fan inlet is accelerated gradually to a maximum at the throat section. The radial rim wheel



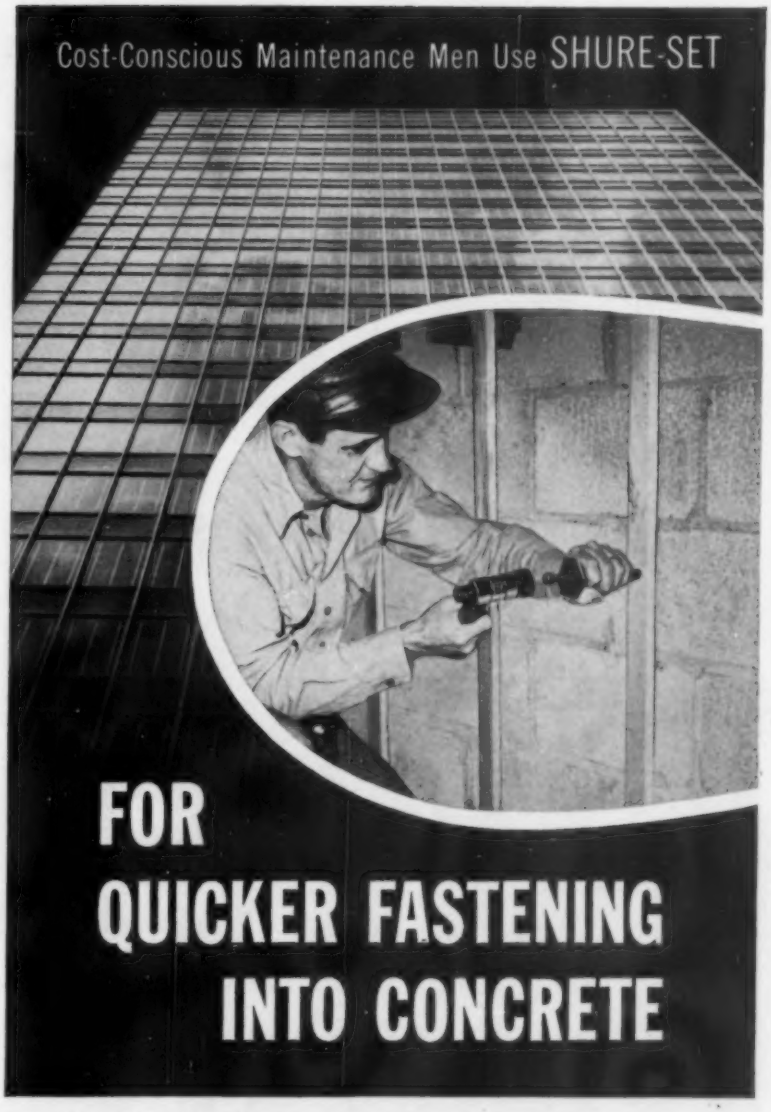
design allows air to expand over the entire blast width and pass over the airfoil shaped blades at relatively low velocity with minimum turbulence.

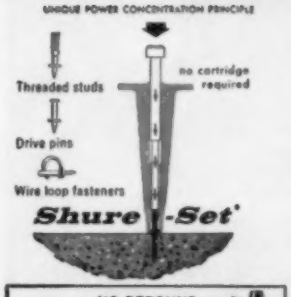
The reduction of turbulence which results from airfoil blading combined with the radial rim wheel contributes to quiet fan operation. Streamlined inlets are aluminum or steel. Manufacturer states that these fans are qualified to carry the AMAC Certified Rating Seal for the full range of sizes, Class I through Class III. Industrial Div., American-Standard.

▲ For details, circle 52 on Post Card

FORM COATING, ADDITIVE for exposed concrete surfaces

Aggretex F is announced as a red, water soluble, non-inflammable coating for application to wood or metal forms to be used to obtain exposed aggregate surfaces on freshly poured concrete, or a rough bonding surface for subsequent concrete or stucco coatings. It is applied to wood by brush or low power spray, and to




UNIQUE POWER CONCENTRATION PRINCIPLE
Threaded studs
Drive pins
Wire loop fasteners
no cartridge required
Shure-Set
NO REBOUND
NEW SHURE-DRIVE® HAMMER with Floating-Action
Newly-patented hammer actually absorbs shock, increases power and reduces worker fatigue. Ask for model R-400.
other products by

The unique "hammer-in" principle of the Shure-Set tool enables you to set threaded studs, drive pins and wire loops into concrete without muss, fuss, or waste. It is a tremendous work-and time-saver... requires no pre-drilling, filling, plugging or cartridge... just place fastener in tool, position against work face, then a few hammer blows drive fastener right through this metal or wood into concrete.

Shure-Set is simple, efficient, economical and *ten times faster* than ordinary light fastening methods. And remember Ramset for heavy-duty fastening. For your dealer's name look under "Tools" in the Yellow Pages, or write us direct for information.

Ramset® Fastening System

OLIN MATHIESON Chemical Corporation — WINCHESTER-WESTERN DIVISION

294-H Winchester Ave. • New Haven 4, Conn.

For more facts circle 613 on Reply Card

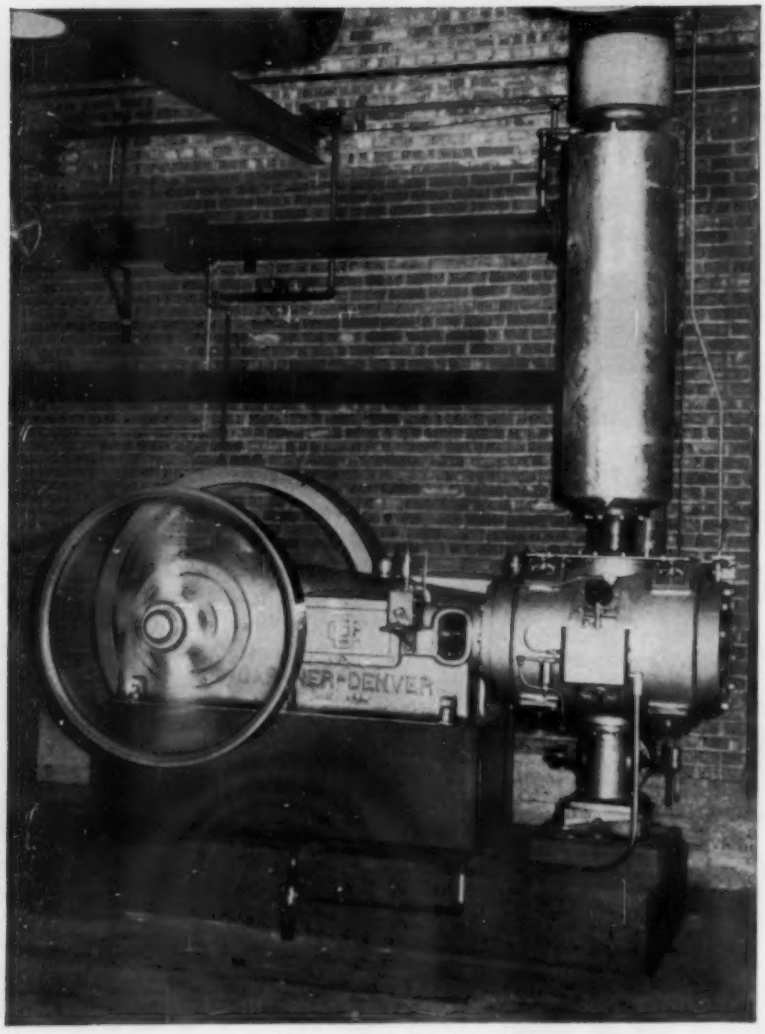
EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER DENVER

For continuous compressed air power, install the Gardner-Denver RX compressor. It assures years of reliable service . . . requires only routine attention. The sturdily engineered, dirt-free power end—that's one reason. And behind the scenes at Gardner-Denver, cleanliness in every step of assembly is another key to endurance. Rigorous testing assures years of efficient, trouble-free performance. Get the full story on RX superiority for 'round-the-clock service. Write for Bulletin HAC-40. Gardner-Denver Company, Quincy, Illinois.

Built for the long run

Gardner-Denver RX



For more facts circle 614 on Reply Card

EQUIPMENT

(Begins on page 166)

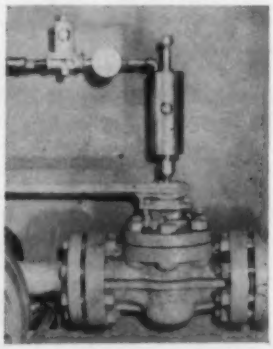
metal forms by brush, unthinned in a continuous unbroken film. Forms may be coated 3 wk before using. Under normal weather conditions, concrete may be poured against coated forms after 3-hr drying time. A stiff brush or stream of water from a hose removes retarded surface concrete.

Aggretex H is a chemically active, grey powder to be applied directly over the freshly poured horizontal concrete surface, to provide either an exposed aggregate surface for architectural concrete, or to provide a rough bonding surface for concrete toppings. Amount of Aggretex H used determines the depth of retarded "surface" concrete and the strength of the concrete at the time the retarded "surface" concrete is removed. A. C. Horn Companies, Div., Sun Chemical Corp.

▲ For details, circle 53 on Post Card

AUTOMATIC LUBRICATOR supplies the plug valves

To furnish a continuous and regulated supply of lubricant to the Rockwell-Nordstrom line of lubricated plug valves, this automatic pressurized lubricator is reported particularly applicable for remote valve installations requiring controlled and automatic lubrication. Manufacturer points out that since lubricator is adjustable there is no waste. Other advantages announced include: a built-in indicator



in the position of the piston; provision for remote control; increased valve life; and light weight—only 2 lb 8 oz. —with working parts of aluminum.

The lubricator consists of three basic parts—piston, cylinder and lubricant chamber. Completing the unit is a pressure regulator. Lubricant is stored only within the hollow piston shaft and lubricant chamber, not within the cylinder. Either air or gas not exceeding 250 psi inlet pressure to the pressure regulator can be used to operate the unit. The complete assembly is 2⅝ in. in diameter, 13½ in. long, and has

a working capacity of 1.6 cu in., the equivalent of two C sticks of lubricant. In general, its use is intended for valves not over 6 in. in size. It costs around $18.00. Meter & Valve Div., Rockwell Mfg. Co.

For details, circle 54 on Post Card

WALL, BOARD visibly organizes working papers

Klip-All is a multiple-clip wall board unit for holding orders, job tickets, route sheets, shipping forms, schedules. It keeps papers where they can be seen and watched until action is taken and they're removed. Of metal finished in gray enamel, the board has a stainless steel frame, two brackets on

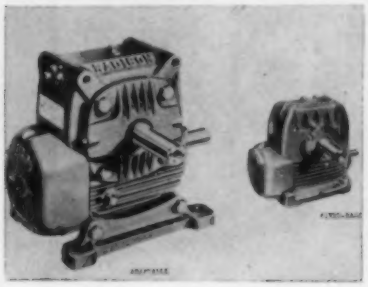
the back for flush mounting or suspension. Clips are white, 2-by-2¼ in., flat and strong enough to hold up to ¾-in. thick papers. Board has various divisions lined off and white plastic holders are at top of each column.

Two basic groups in four sizes are stocked. A calendar style has boards arranged by daily, weekly and monthly periods. The one shown is a perpetual daily calendar style, with a guide to exact starting dates, divisions for two weeks. The other type of board, designed for applications, is similar but set up by departments, branches, production steps. L. D. Blehart Co.

For details, circle 55 on Post Card

WORM GEAR REDUCERS are small sized, fan-cooled

Featuring center distances as low as 1⅛ in. these worm gear units are named Radicon (radiation and convection) Reducers to emphasize important heat transfer benefits. Controlled transfer of heat by convection is obtained by a moving stream of air induced by



Team Push-Pull Power...

lift and load faster

Saving time and muscle, a Gardner-Denver "Hoistractor" and air hoist team up to provide economical push-pull power in handling heavy plant loads like this. One man, using only one hand, controls the entire operation.

The Gardner-Denver "Hoistractor" is an air-powered hoist trolley connected to the hoist by a drawbar. Both units ride the same beam. Hoist lifts and lowers . . . "Hoistractor" moves hoist *and* load along the beam.

This unusual combination of Gardner-Denver "Hoistractor" and hoist teams two-way power for faster, cheaper material handling. Write for bulletins.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER Since 1859

GARDNER DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario

For more facts circle 615 on Reply Card

THE MOST COMPLETE LINE OF MECHANICAL PACKINGS* SOLD THROUGH INDUSTRIAL DISTRIBUTORS

Dependable Local Service •
Always Available •
Prompt Delivery

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* HIGH PRESSURE ASBESTOS • ROTARY PUMP PACKINGS • VALVE PACKINGS • V-RINGS • LEATHER PACKINGS • SHEET PACKINGS AND GASKETS • HYDRAULIC & PNEUMATIC PACKINGS • METALLIC PACKINGS • PLASTIC PACKINGS • TEFLON PACKINGS & GASKETS • SPIRAL WOUND GASKETS

Better Buy BELMONT

THE BELMONT PACKING & RUBBER COMPANY • PHILADELPHIA 37, PA.

For more facts circle 616 on Reply Card

EQUIPMENT

(Begins on page 166)

the unit's maximum diameter, which forces high velocity air along horizontal channels formed by external ribbing in the housing. Also, heat is dissipated through radiation, assisted by vertical ribbing on the unit.

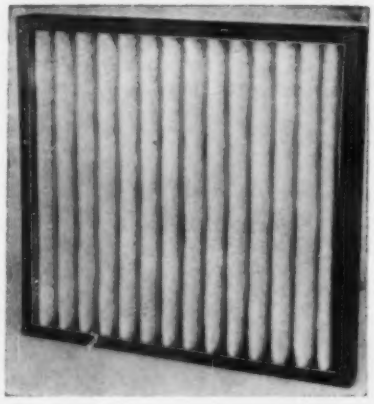
Universal mounting is another feature. These reducers have detachable feet for all adaptable models, facilitating mounting horizontally, vertically or from any side position. Adaptable models are of "drywell" construction to prevent oil leakage from output shaft. Twelve sizes cover center distances from 1⅛ to 8 in., input capacities from 0.01 to 68 hp, output torque to 46,000 lb-in. Speed rations are available from 5:1 to 70:1. Foote Bros. Gear & Machine Corp.

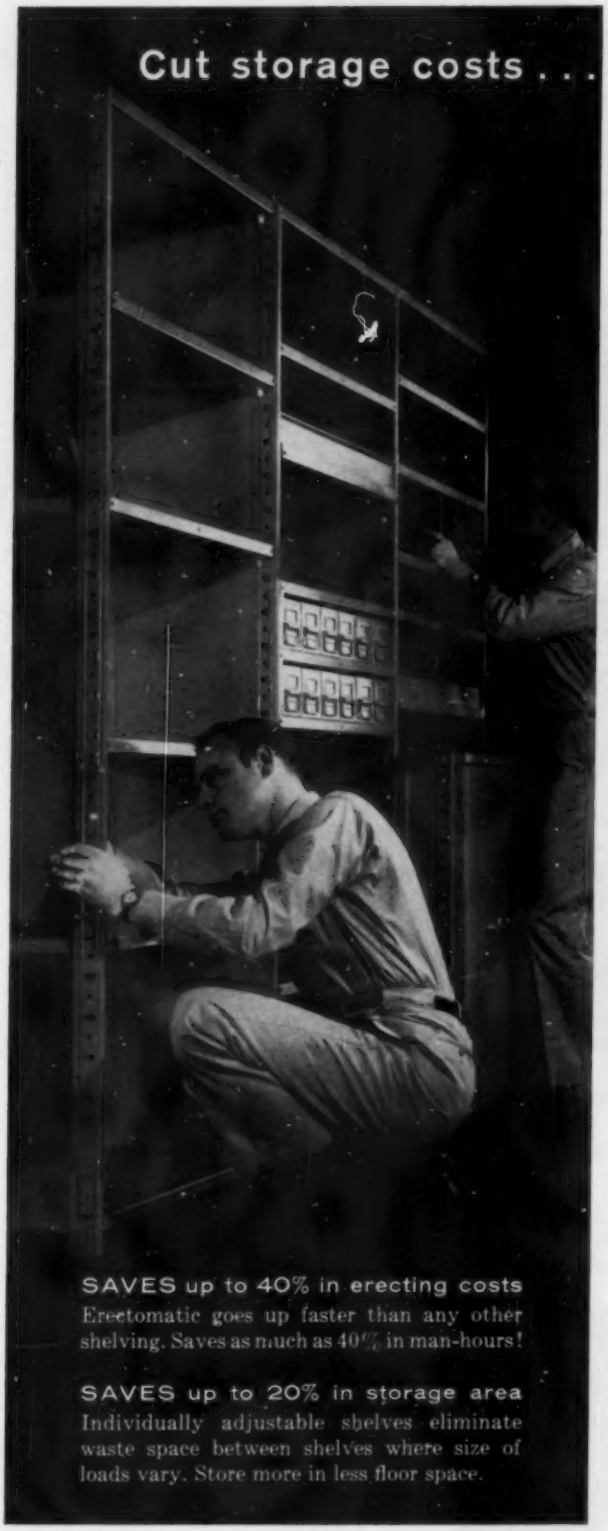
▲ For details, circle 56 on Post Card

Reader Service Post Cards for requesting more details on products described are provided on pages 243-244.

AIR FILTER cleans better, holds more dust

In design, the Pure-Air Extended Surface Filter consists of 2-in. high pleats set on 1¼-in. centers with each pleat supported by a strip of cardboard set on edge. Under the influence of the air stream, each pleat becomes a parabolic shaped pocket, and because of the parabolic shape the least resistance to air flow is at the back of the pocket and the resistance gradually increases up the sides. This filter is claimed to have a total effective filtering area four times that of fiber glass throw-away filters, far greater dust arrestance than most viscous coated filters. It is designed to fit into all types of filter banks and no supporting




Cut storage costs . . .
SAVES up to 40% in erecting costs
Erectomatic goes up faster than any other shelving. Saves as much as 40% in man-hours!
SAVES up to 20% in storage area
Individually adjustable shelves eliminate waste space between shelves where size of loads vary. Store more in less floor space.

Save floor space with

HALLOWELL

ERECTOMATIC® SHELVING

Only ERECTOMATIC gives you these features:

Quick Shelf Installation. Position shelf support. Slide in shelf, press latches. Takes only seconds. No tools needed.

Straight-in, Straight-out Shelf Change. No tilting, unloading, disturbing other shelves. No removing bin fronts, dividers, etc.

Full Use of Shelf Area. No tees, no angles. Beaded posts let you make use of full shelf width. (And reduce cuts and snagged clothes.)

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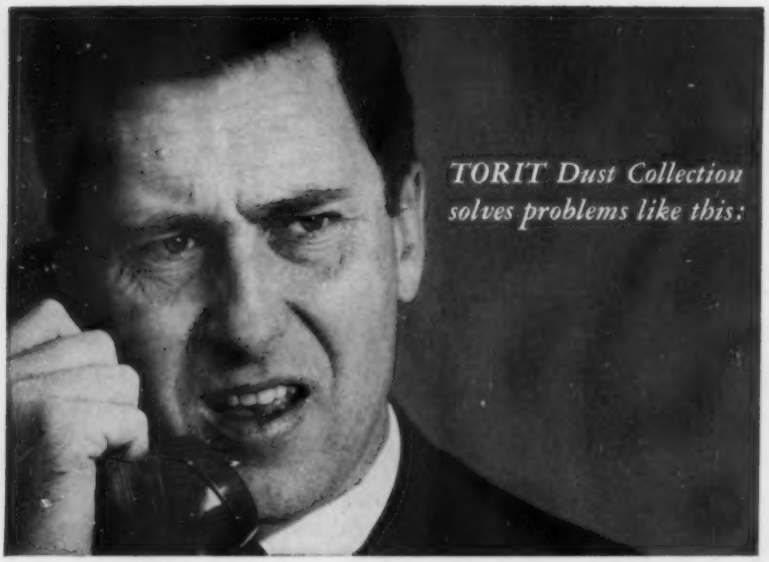
COLUMBIA-HALLOWELL Division **SPS** JENKINTOWN 26, PA. • SANTA ANA, CALIFORNIA

where reliability replaces probability

For more facts circle 617 on Reply Card



"6 MEN OUT AGAIN TODAY?" "WHY?"

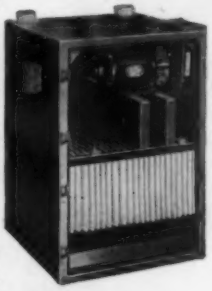
"I was on the receiving end of that question. And I knew what the boss was driving at. Production-wise, we couldn't stand our current rate of absenteeism. Even the men on the job were dragging their feet. To show you what I mean: we had just lost one of our best customers. Reason: one too many late shipments.

"Logically, when sickness strikes, you consult a doctor. Which is what I did. Without actual examinations, he couldn't diagnose the trouble. But he did give me the clue when he asked, 'How are your working conditions?'.

"Frankly, our plant is dirty. Or better put, dusty. With grinding machines running 24 hours a day, how could it be anything else? With that thought, I remembered. A salesman had been in my office just the other day talking about dust. I had too many production headaches at the time to hear him out. But I kept his card. So I called him back.

"He was from Torit. He was selling Torit Dust Collectors . . . machines that trap dust. When I compared the low cost of his equipment with the high cost of our production lag, I decided it was worth a try. So I bought one . . . just one, to start, for $285.00. We installed it ourselves on a key machine.

"The change in the man operating that machine sold me. Within a month, we had a Torit Dust Collector system attached to seventeen dust-producing machines in the plant. As a result, the air in our plant is clean, the way it should be. Our absentee rate is no longer a problem. Our production rate is at top speed. And you know something? I feel better myself!"



Is dust doing you *dirt? For complete facts on dust damage . . . and how to control it . . . write:*

TORIT manufacturing company

Dept. 1824, 1133 Rankin Street, St. Paul 16, Minnesota

For more facts circle 618 on Reply Card

EQUIPMENT

(Begins on page 166)

devices are required. Manufacturer points out that because this filter is made of an unoiled media there is no risk of ceiling discoloration caused by entrained oil in the air stream. Arco Mfg. Corp.

▲ For details, circle 57 on Post Card

DUAL FUEL HEATER is multi-purpose model

The OG4 series is announced as a UL listed product for use as central furnace, unit heater with directional discharge nozzles, or duct furnace with performance capabilities for future addition of industrial air conditioning. It can be installed for up-flow, down-

flow or horizontal delivery. A feature announced is provision for unrestrained expansion and contraction even at 180 F rise operation.

Either No. 2 fuel oil or gas are burned in a single burner assembly with fuel selection determined by manual selector switch (standard) or optional automatic selector. The oil burner is mechanical atomizing type; the gas burner is inshot type for natural, manufactured, mixed and LP-air mixtures. Belt-driven induced and forced draft blowers are mounted on one shaft with air cooled bearings, powered by a ¾ hp motor. The unit is adaptable to all voltages; control circuit is 115 v. Output capacities are 750,000 and 1,000,000 Btu. Lennox Industries Inc.

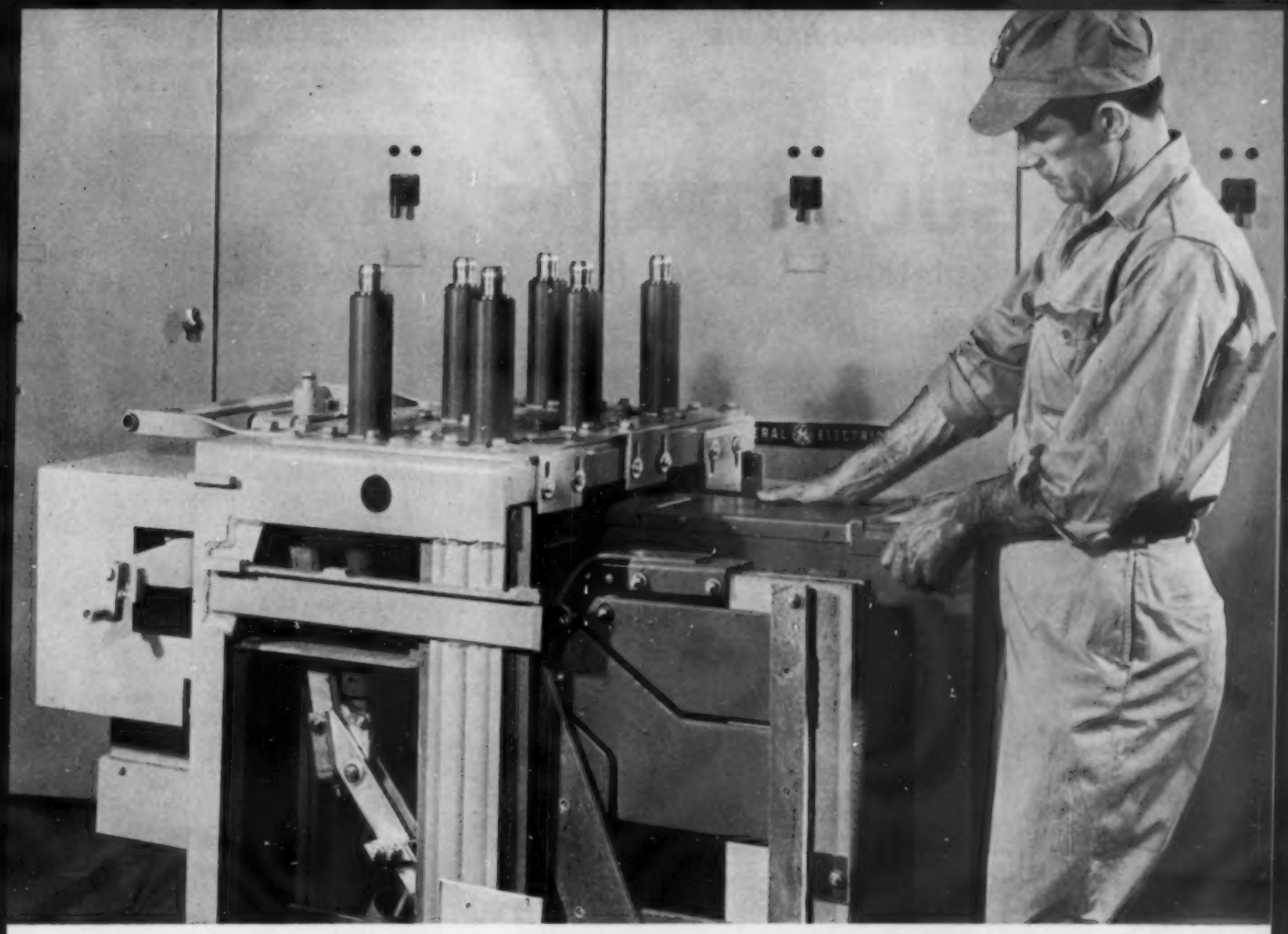
▲ For details, circle 58 on Post Card

DRILL PRESSES are adaptable power feed units

Available in bench, floor and multiple-spindle models and as an overhead track-mounted tool these 20-in. power feed drill presses are said to combine adaptability of a power tool with ruggedness and capacity of a machine tool. A feature is a connection from which automation devices, such as ro-

Change hats with your maintenance man, he will demonstrate . . .

FAST MAINTENANCE



General Electric's exclusive *Vertical Lift* Metal-clad Switchgear gives you 20 minute routine maintenance

Reduce your switchgear operating expense with the fast, efficient maintenance made possible through General Electric's Vertical Lift design.

Your maintenance man can expose the contacts of General Electric Metal-clad switchgear in just one minute—for cleaning, inspection and adjustment—by removing only the box barriers. Arc chutes can be left in position.

And under normal conditions, G-E Magne-blast breakers can be removed from their housing, given routine maintenance, and returned to service in just 20 minutes.

This fast routine maintenance saves you costly maintenance time—another reason why General Electric manufactures Vertical Lift Metal-clad switchgear.

Contact your General Electric switchgear representative for more information, or write for Metal-clad bulletin, GEA-5664, to Section 511-38, General Electric Company, Schenectady 5, New York.

VERTICAL LIFT'S 3 STEPS TO SWITCHGEAR SUPERIORITY:

STEP 1: Disconnect breakers automatically—only Vertical Lift design permits operator to actually see when disconnects are parted.

STEP 2: (Illustrated) Remove breaker, slide out box barrier—Vertical Lift design allows operator to inspect contacts without moving arc chutes.

STEP 3: Remove protective cover—only Vertical Lift Metal-clad has the breaker operating mechanism up front for easy access.

Progress Is Our Most Important Product

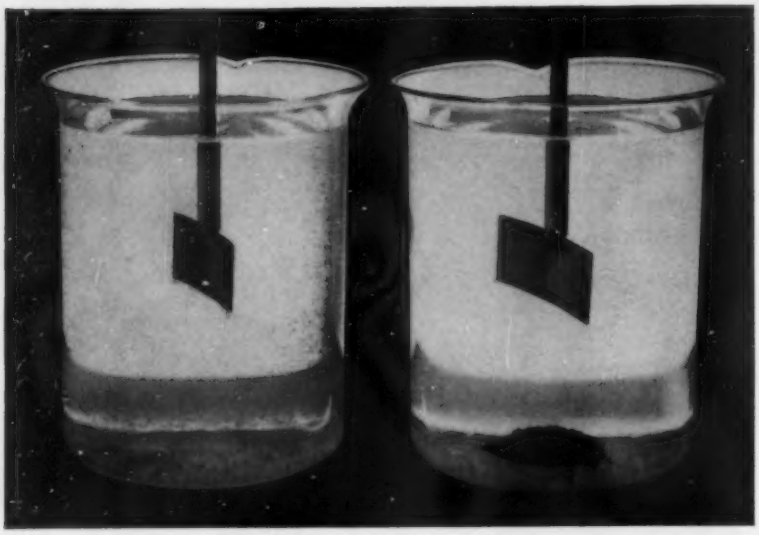
GENERAL ELECTRIC

For more facts circle 619 on Reply Card

Send today for your Coagulant Aids Bulletin HSP-919

HAGAN COAGULANT AIDS

Faster coagulation . . . larger floc . . . increased throughput . . .



River water with Coagulants
Only 50% of floc settled in 3 minutes

River water with Coagulants plus Hagan Aid
99% of floc settled in 3 minutes

Scientifically formulated Hagan Coagulant Aids 2, 7, 11 and 18 are most effective means of improving coagulation in all types of clarification equipment, and are completely safe for drinking waters.

Supplied in free-flowing granular form, they are easy to use since they may be dry fed or readily prepared as slurries. While Aid No. 2 is a pure polyelectrolyte, Aids 7, 11 and 18 are intimate blends of: (1) polyelectrolyte to promote rapid floc growth and (2) processed clays to serve as nuclei around which floc forms readily. They also provide weight to increase the settling rate of the floc. One of the Hagan Coagulant Aids will meet your specific water condition.

In over three years of use in water clarification, Hagan Coagulant Aids have increased clarifier throughput rates, reduced floc carryover, simplified clarifier operation, improved color removal and even reduced overall chemical treatment costs in many plants.

We shall be glad to conduct coagulation studies to determine which of the several Hagan Coagulant Aids is best for your particular operation. For information, write:

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

HAGAN DIVISIONS: CALGON CO.-HALL LABORATORIES-BRUNER CORP.

For more facts circle 620 on Reply Card

EQUIPMENT

(Begins on page 166)

tary tables, may be controlled and synchronized with spindle operation. The power feed has a front-mounted pilot wheel control mechanically integrated with clutch control, allowing one-hand

operation. There are four feed ratios—from 0.004 to 0.012—with each of the five spindle speeds. The same pilot wheel is used for manual feed and no adjustments are required for changeover. A "come-type" clutch permits use of power feed on a production basis through a wide range of hole diameters. Although primarily a metalworking production tool, these presses are also intended for maintenance applications. A single spindle floor model lists under $600. Walker-Turner Div., Rockwell Mfg. Co.

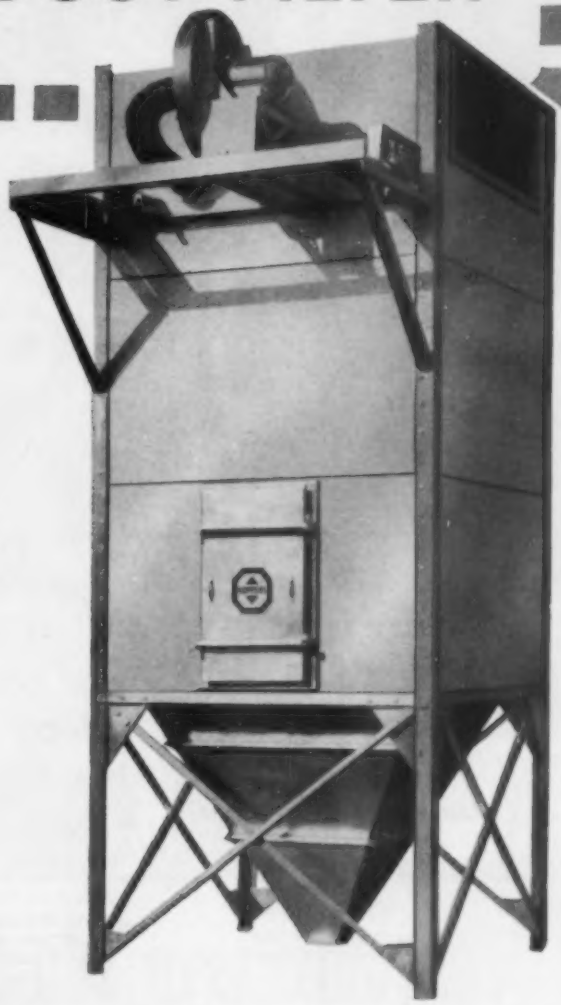
▲ For details, circle 59 on Post Card

DUAL PURPOSE HOSE protects on both sides of wall

Hide-A-Hose is designed to provide quick fire protection from either side of wall. The hose is stored on a reel mounted on one side of the wall. On the opposite side of the wall is a door to the compartment holding hose nozzle and valve. These are accessible from both sides of the wall and the hose may be pulled out from either side. Hide-A-Hose can be installed for service between rooms inside a building, or to permit use both indoors and

Reverse-air jet filtering comes of age with the

NEW KOPPERS MODEL K AEROTURN® DUST FILTER



NEW PERFORMANCE

Highest filtering efficiency and increased capacity are benefits you get in the all-new Model K Aeroturn. Fifteen years of diversified application experience have combined to produce a dust filter offering the utmost in performance and reliability.

NEW ECONOMY

Revolutionary new self-adjusting blow rings and proven pressure controlled filter cleaning reduce wear — increase filter tube life — cut operating expense. Rugged, simplified construction virtually eliminates maintenance costs and downtime.

NEW FEATURES

Koppers Model K Aeroturn has been completely redesigned for demanding industrial service—the only new reverse-air jet filter on the market. Such features as new blow rings, new carriage drive system and simplified, standardized design help you recover more product, cost less to operate and serve you more dependably.

NOW, MAIL THIS COUPON for complete information!

KOPPERS **AEROTURN® DUST FILTERS**

Engineered Products Sold with Service

KOPPERS COMPANY, INC., Industrial Dust Filter Dept., 4208 Scott Street, Baltimore 3, Md.

Gentlemen: Please send me a free copy of your new Aeroturn brochure complete with descriptions, drawings and photographs.

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

For more facts circle 621 on Reply Card

Select the test equipment that takes the guesswork out of electrical protection!

MULTI-AMP *Now* offering your choice of **four new catalogs on:**

Universal Portable Test Sets

- **PROTECTIVE RELAYS**
  Catalog SB-RT-1
- **OIL CIRCUIT RECLOSERS**
  Catalog SB-OCR-1
  Standard Ratings 4, 7.5, 15Kva
- **CIRCUIT BREAKERS**
  Catalog SB-CB-1
  Standard Ratings 1, 2.5, 5, 7.5, 15, 22.5 Kva
- **UNIVERSAL PORTABLE LOAD BOXES**
  Catalog SB-LB-1
  Standard Ratings 0.1 through 5Kva

MULTI-AMP will be pleased to send you these four descriptive, colorful and well illustrated catalogs. Developed to help you select the proper test equipment for every application, these valuable catalogs offer over 80 pages of complete and detailed information on every advanced MULTI-AMP unit. They're easy to obtain, simply drop us a note on your company's letterhead. Your new MULTI-AMP catalogs will be on their way by return mail.

Write Today! Dept. PLE

MULTI-AMP Division
MULTI-AMP ELECTRONIC CORPORATION
465 Lehigh Avenue, Union, New Jersey
For more facts circle 622 on Reply Card

EQUIPMENT

(Begins on page 166)

outdoors. Installation is reported simple and inexpensive. The unit includes a double-flanged 44-in. diam. aluminum reel, aluminum compartment, 16 in. wide by 8 in. high, 150 ft. of ⅝-in. garden hose and a brass fog and stream nozzle. The hose cannot kink when pulled out, it is noted, because the action of pulling it out releases a brake on the hose reel. As soon as the pulling of the hose is stopped, the brake reengages the reel, stopping rotation at that point. Flinchbaugh Murray Corp.

▲ For details, circle 60 on Post Card

SAFETY CLOTHING resists molten metal splash

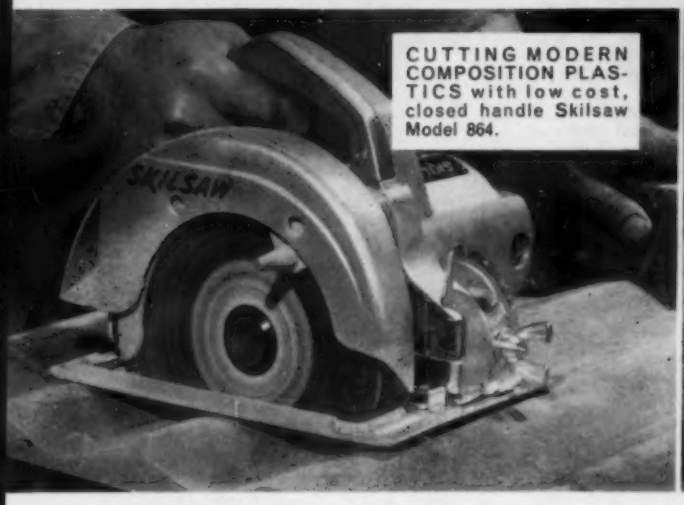
Asbestos safety clothing made of Thermogarb is designed to shed molten metal at 3000 F without deterioration, loss of resiliency or discoloration of inner side. The woven fabric offers 40 to 50 per cent greater abrasion resistance than most asbestos, according to manufacturer, and has nearly double the tensile strength of fabrics twice its weight and thickness. Garments of Thermogarb also reflect about 50 per cent of radiant heat and are light in weight—a 30-in. length coat weighing only 3¾ lb. Thermogarb Clothing is also suggested for applications involving exposure to glass, chemicals, ceramics and oils. The line includes coats, leggings, cape sleeves, coveralls, sleevelets, spats, pants, chaps and aprons, all in white or yellow. American Optical Co.

▲ For details, circle 61 on Post Card

ANGLE VALVE with quick-change trim feature

Quick-change trim can be replaced in minutes without opening line piping in the V-10, a low-noise throttling valve for high-pressure liquid and steam. Valve plug, guide and seat can be replaced in little more time than required to open and close a bolted

CUTTING STAINLESS with high speed, top handle Skilsaw Model 857 and aluminum oxide cut-off wheel.



CUTTING MODERN COMPOSITION PLASTICS with low cost, closed handle Skilsaw Model 864.

CUTTING ALUMINUM with extra powerful, rear handle Skilsaw Model 77 —world's best known power saw.

Skilsaw power saws cut everything...

thinnest plastics to diamond-hard alloy steels

Equipped with one of 20 specialized cutting blades, a Skilsaw power saw will cut the following materials quickly, easily and at low cost:

High speed steel • Aluminum • Cast iron • Asbestos cement • Lead • Woods • Brass • Plastics Copper • Ceramic Tile • Concrete • Stone • Rubber • Laminates

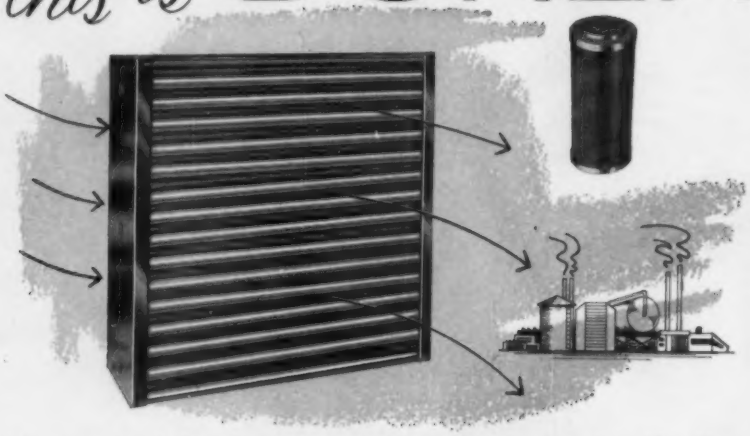
Power packed, dependable Skilsaw Power Saws are the world's best known, most used portable power saws. World's most complete line, too . . . select from 4 styles, 18 models in all!

Your Skil distributor can help you select the right model saw and blades for your cutting requirements. Look under "Tools-Electric" in the Yellow Pages. Or for full information, write: Skil Corporation, 5033 Elston Avenue, Chicago 30, Ill., Dept. 120H.

SKIL ... AND SKILSAW POWER TOOLS

For more facts circle 623 on Reply Card

this is DOREX



27 years of Research, Development, and Application make it the most effective, economical method of AIR RECOVERY and ODOR CONTROL

WHAT DOREX IS . . .

Dorex equipment is designed in two basic types—C Cells and H Canisters—Dorex acts exactly like a gas mask, using activated carbon to adsorb air-entrained odorous, gaseous, and vaporous irritants and impurities. As a direct result of the carbon's highly effective purging action, stale and/or contaminated air is purified and reconverted to its original healthful freshness, ready for sanitary re-use in air conditioning systems. The Dorex process eliminates the biggest obstruction to maximum economy in air conditioning.

HOW DOREX WORKS . . .

Dorex efficiently solves the several air pollution problems menacing business, industry, and the general public: purification of severely contaminated intake air (smog); purification of recirculated air; purification of contaminated exhaust air.

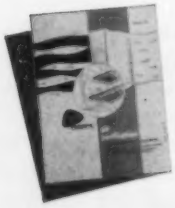
WHERE DOREX IS USED . . .

Dorex is used throughout business and industry, in combination with air conditioning and ventilating systems . . . in office buildings, department stores, food processing plants, distilleries, electrical and electronics plants, atomic energy labs, paper factories . . . virtually anywhere that polluted air creates severe problems of offensive odor, equipment corrosion, and toxic atmospheric conditions.

WHY DOREX IS THE MOST EFFECTIVE

Dorex engineers always select the type of carbon that years of Connor research and experience have proved is most successful in different given situations. There is *no single all-purpose* type of activated carbon that can be applied successfully in all air recovery and air purification situations.

CONNOR... for Constant Comfort Conditions



Request—on your letterhead, please—copies of Dorex Bulletin 108A and the authoritative air purification textbook available only from Connor, "Air Conservation Engineering".

CONNOR ENGINEERING CORPORATION

DANBURY • CONNECTICUT

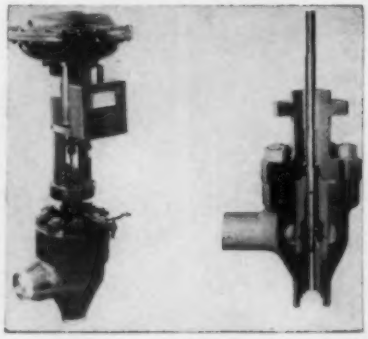
dorex® air recovery

For more facts circle 624 on Reply Card

EQUIPMENT

(Begins on page 166)

joint, it is pointed out. The valve is designed for severe service, where pressure drops may be as high as 3500 lb or where flashing may occur. It is



angle style, diaphragm-operated and available in 1500-, 2500- and 4500-lb classes, from 1½- through 4-in. sizes. The quick-change trim is available in the 1500- and 2500-lb classes. Product Specification Sheet 704.21 gives full details. Republic Flow Meters Co.

▲ **For details, circle 62 on Post Card**

CHUCKING GRINDER features fast set-up time

Simplified positioning of headstock and grinding wheel on Type R Chucking Grinder reduces set-up time to a minimum for pieces that can be effectively ground in a chuck, it is announced. Faces, outside diameters, radii and tapers can be ground singly or in combination. Wheels can be spaced, if necessary, and dressing arranged to produce desired profile. Faster set-up time is attributed to designing the grinding wheel to move and V and flat ways. The Type R feed provides a rapid feed, slow grinding speed, and sparkout. Rapid advance is adjustable from ¾ to 2 in.; slow grinding speed is adjustable for rate and amount up to 0.082 in. on work diameter. A feature announced is anti-

FALK Motoreducers driving log conveyor and refuse conveyor at the modern mill of The Bohemia Lumber Company, Culp Creek, Oregon.

FALK *all-steel* Motoreducers give you longer service life

Whether your load conditions are normal or heavy, the extra rigidity of all-steel construction (more than twice that of cast iron) maintains better alignment of revolving elements under load...a vital factor in prolonging the service life of gears and bearings.

And if your installations are subject to shock loads, or accidental external impacts, you're way ahead when you install Falk All-Steel Motoreducers. These rugged units do not destroy themselves by tearing off their feet under jamming overloads, nor are their housings subject to cracks which both dissipate the vital lubricant supply and allow revolving elements to get out of alignment.

All-steel construction is one of the built-in extras that you get in Falk Motoreducers. Others include: (1) inherently stronger gear teeth (by AGMA standards), thanks to exclusive Falk extra-depth, high pressure angle helical gears; (2) maximum mechanical efficiency (98½% per gear mesh, under full load); (3) your choice of standard units (horizontal, vertical or right angle) to fit your precise requirements.

HORSEPOWER RANGE: to 75 hp . . . STANDARD OUTPUT SPEEDS: 780 rpm (high) to 1.2 rpm (low).

Prompt delivery from distributor stocks, or from warehouse or factory. Ask your Falk Representative or Authorized Falk Distributor for ***Bulletin 3100.***

THE FALK CORPORATION, MILWAUKEE 1, WIS.

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in most principal cities

For more facts circle 625 on Reply Card

FALK

. . . a good name in industry

Take your choice of all-steel drives when you specify Falk

THE FALK ALL-MOTOR MOTOREDUCER
...the original All-Motor unit

THE ALL-STEEL FALK SHAFT MOUNTED DRIVE

Torque ratings to 44,000 lb-in at low speed shaft. Also available in flange-mount design.

FALK and ALL-MOTOR are Registered Trademarks.

No. 4 in a series of washroom survey comments from "SBS soap counselors"

We showed them how "waterless" skin cleanser cuts wash-up costs!

James J. Hosking

is a SBS soap counselor in the Great Lakes area. A specialist in industrial soaps for several years, he has pinpointed economical solutions to skin hygiene and wash-up problems for many plants. Here's a typical example:

"Workers in this Midwestern chemical plant come in daily contact with hard-to-remove, irritating soils — like carbon, caustic soda, salt brine, alkalines, greases, metal filings and cutting oils. Special clothing and gloves offered only partial protection. We found many workmen scrubbing their hands in harmful solvents . . . and making far too many time-consuming trips to the washrooms. I showed management how easily it can discourage the use of injurious solvents and *pick-up lost production time* by putting our SBS 30 Waterless Skin Cleanser at each worker's fingertips. A pleasant cream, SBS 30 cleans without water, quickly and easily removes stubborn, irritating soils . . . puts an end to many costly trips to washrooms."

Money-saving suggestions like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J.
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 626 on Reply Card

EQUIPMENT

(Begins on page 166)

friction dresser, with which it is possible to dress 90-deg corners. The machine has a 24-in. grinding wheel driven by a 7½-hp motor. Wheels can be up to 4 in. wide. Landis Tool Co.

▲ For details, circle 63 on Post Card

HOLLOW SPINDLE DRILL does the difficult jobs

Super-hard exotic metals and Cermets are no problem with the RPMster, says manufacturer. This hollow spindle drilling machine offers high pressure coolant system, higher spindle speeds and feed speeds for advanced drilling

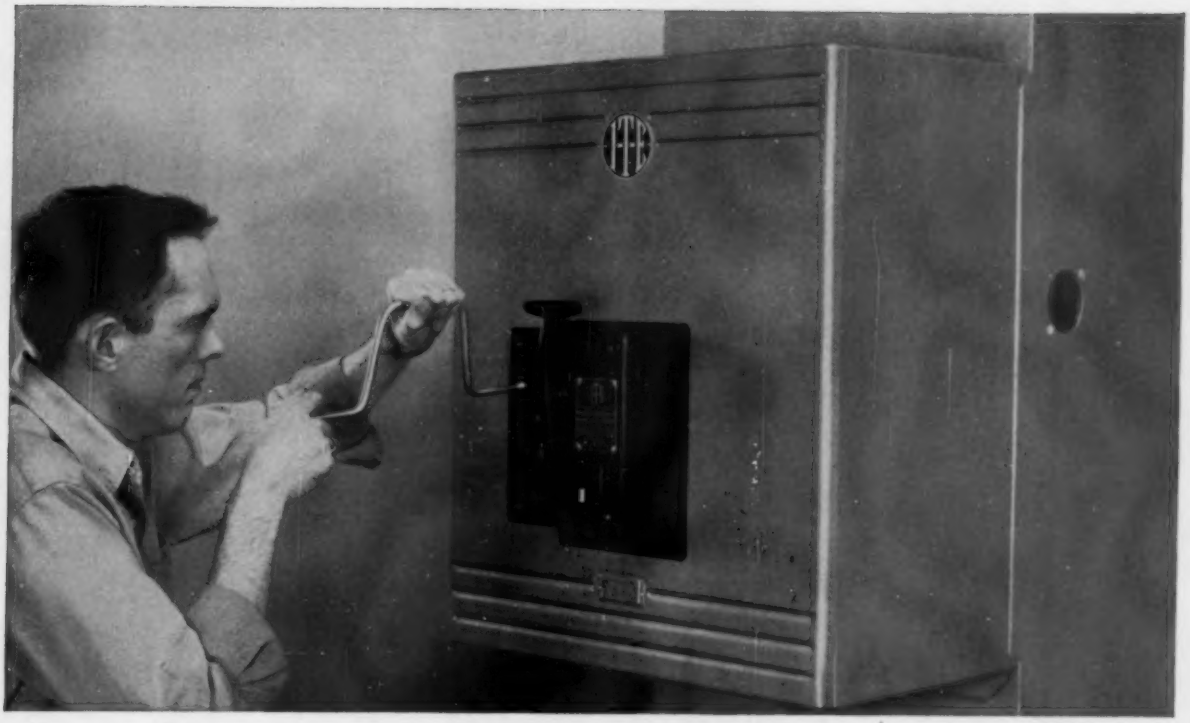
bits. Successful drilling through titanium, stellite, and stainless steel etc. is reported, also greatly increased productivity in production runs, with cuts close to drill diameter. A feature is use of a timing belt instead of conventional V-belt drive. The easily variable range of speeds has been nearly doubled, it is pointed out, and speeds provided are suitable for all types of work within the capacity of the machine—drilling, tapping, soft-facing, counterboring. Buffalo Forge Co.

▲ For details, circle 64 on Post Card

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 243-244

DRIVE-THROUGH RACK increases storage space

Assembled from standard pre-fabricated components, this drive-through rack comes almost entirely assembled. According to manufacturer, an 18-ft high rack for 126 pallets requires only 16 man-hours to erect. Drive-through racks have overhead bracing only. Both ends are open for loading and



Urelite® gives you double safety

Exclusive with I-T-E

Independent drawout design
Visible separable contacts

In an individually enclosed large air circuit breaker, you couldn't ask for more safety than the I-T-E URELITE gives you. To disconnect it, just insert the crank at the front and turn. Cover need never be removed. A look through the side window positively shows you the position of the separable contacts. Also, with the circuit breaker open, it can be padlocked safely in either connected or disconnected position.

The whole truth is that URELITE breakers are unmatched for exclusive safety provisions, and for low-cost installation, easy access, longer contact life, and adjustable overload devices for higher loads. They handle circuits up to 600 volts, 15 to 4000 amp continuous and 150,000 amp interrupting. Write for new bulletin 4261-2B. I-T-E Circuit Breaker Company, Dept. LA, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 627 on Reply Card

Ventilating Fans
Roof Ventilators
...a galaxy of products to solve your air handling problems...
Industrial Fans
Centrifugal Unit Heaters
Propeller Unit Heaters
General Purpose Fans
nyb
THE NEW YORK BLOWER COMPANY
Sales offices: 3163 South Shields Avenue • Chicago 16

For more facts circle 628 on Reply Card

EQUIPMENT

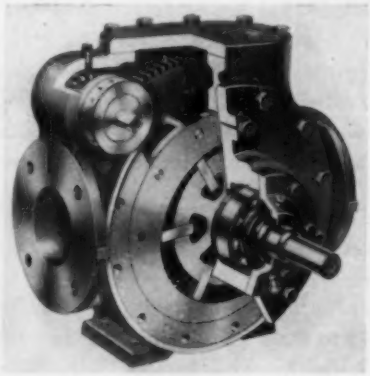
(Begins on page 166)

unloading, and the overhead bracing provides added structural strength by tying the rack into a single, rigidly aligned unit. Pallets are stationed on support rails on both sides of each bay, width of bays being determined by pallet sizes. Sturdi-Bilt Materials Handling Div., Union Asbestos & Rubber Co.

For details, circle 65 on Post Card

VARIABLE FLOW PUMPS let you "dial" the rate

With the Vari-Flow, you can "dial" desired flow rate from zero to full capacity without changing pump speed, it is announced. Thus, this pump can be powered with any standard-speed motor and provide advantages of variable speed drives. Manufacturer notes, also, that the Vari-Flow can reverse its flow while in operation simply by a



turn of the dial—permitting evacuation of discharge lines without additional bypass piping and valves.

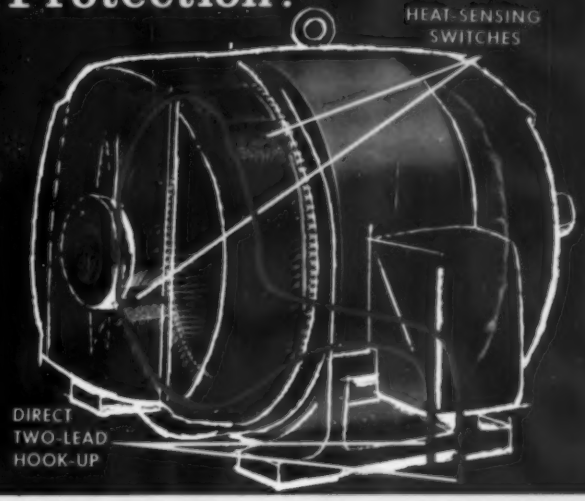
There are three areas of application to which Vari-Flow Pumps are claimed particularly suited. One is where a change in flow rate is required to meet varying delivery conditions, such as filling storage tanks and drums with

GENERAL ELECTRIC

New Concept in Motor Protection!

Tri-Clad '55' Thermo-Tector

SYSTEM ENDS OVERLOAD BURNOUT!



General Electric offers a *totally new* type of protection on *all* Tri-Clad '55' motors 7½-125 hp!

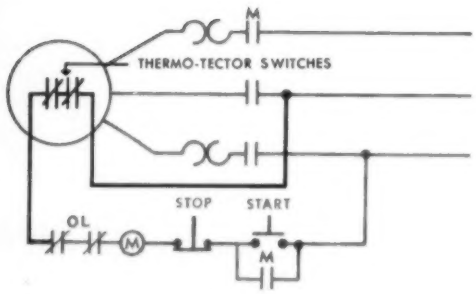
Exclusive THERMO-TECTOR system has heat-sensing switches buried in stator windings. Switches shut off motor *only* when stalls, overloads or other conditions threaten heat damage to motor windings.

Unique THERMO-TECTOR system "anticipation" feature varies motor shut-off point according to rate of winding heat rise. This flexibility allows *maximum motor output* under all conditions.

TURN PAGE FOR FURTHER INFORMATION

NEW Tri-Clad® '55' THERMO-TECTOR SYSTEM

Allows Full Motor Output— No Wasteful "Safety Margin" Needed



Thermo-Tector system needs no costly *amplifying relays*, connects directly to any G-E motor controller.

You get full output from Tri-Clad '55' motors with Thermo-Tector system. Variable response feature of heat-sensing switches allows motor to operate right up to safe limits under any operating condition.

Thermo-Tector switches are offered on *all* Tri-Clad '55' motors in frames 254U-445U. For more information, contact your G-E Apparatus Sales Office or write for Bulletin GEA-7092, Section 866-03, Schenectady 5, N. Y.

SMALL AC MOTOR & GENERATOR DEPARTMENT

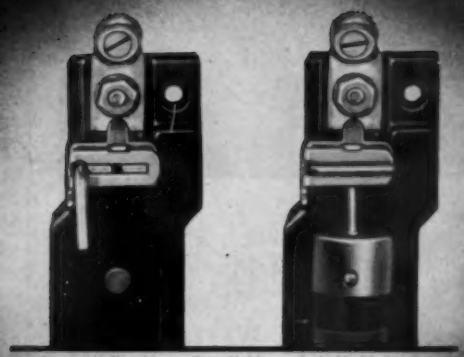
GENERAL ELECTRIC

Kamklamp Fuse Holders in

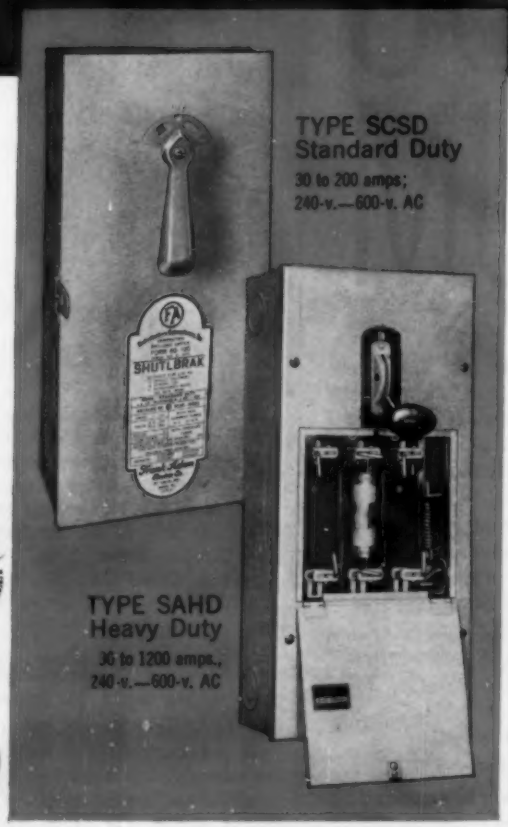
FRANK ADAM

SAFETY SWITCHES

prevent loose connections
that generate heat



Levers in Kamklamp Fuse Holders grip knife-blade terminals between vise-like case hardened steel jaws; ferrule terminals under tightly drawn steel bands. Eliminated are connections that loosen and burn.



Kamklamp Fuse Holders—*exclusive* in Frank Adam Switches—lock cartridge fuse terminal immovably in position, and provide tight, flexible connections under constant tension that will not become loose and heat up. Overloads cause heat and expansion, then subsequent cooling and contraction, which loosens ordinary contacts making them flash and burn. Kamklamp Fuse Holders help eliminate this major cause of trouble.

Another Frank Adam exclusive is the rugged Shutlbrak® switch mechanism that won't arc or pit. Pre-shipment testing under loads twice the rated voltage plus 1000 volts—front handle operation that permits space-saving side-by-side installation—one piece molded pole units—these are only a few of the features that make Frank Adam Safety Switches the industry's best buy. *Write for catalog.*

KEEP PACE WITH ELECTRICITY
See our catalog in SWEETS

FRANK ADAM ELECTRIC COMPANY
SINCE 1891
P.O. BOX 357, MAIN P.O. • ST. LOUIS 66, MO.

busduct • panelboards • switchboards • service equipment
safety switches • load centers • Quikheter

For more facts circle 630 on Reply Card

Sundstrand Machine Tool Company, Belvidere, Ill.
—showing 4" Ribbed Embossed exterior of
Field Assembled Insulated Wall.

SECOND STORY REALLY

TELLS THE TALE . . .

NO MAINTENANCE WITH

REYNOLDS ALUMINUM

COMMERCIAL ROOFING AND SIDING

It's ladders and scaffolding—second story work—that makes maintenance men appreciate Reynolds Aluminum siding. Once it's up, you'll probably never have to get up there again. No protective painting needed . . . because aluminum can never rust and defies corrosive atmospheres that can destroy other materials.

Reynolds Aluminum roofing has the same freedom from maintenance. And roof and siding together give your building the advantage of high radiant reflection all around . . . improving the comfort of workers winter and summer . . . cutting the costs of heating and air-conditioning.

Available in Corrugated, 4" and 8" Ribbed Embossed, V-Beam and Roof Deck . . . all in natural aluminum *and in 20 New "Colorweld* 60" Colors,* embossed or mill finish. These materials also combined in Field Assembled Insulated Wall Systems. For full information call any Reynolds sales office. Or write to **Reynolds Metals Company,** Richmond 18, Virginia.

**Trademark of Reynolds Metals Company*

Watch Reynolds TV Shows: "BOURBON STREET BEAT" and "ADVENTURES IN PARADISE"; and, resuming in October, "ALL STAR GOLF"—ABC-TV.

For more facts circle 631 on Reply Card

EQUIPMENT

(Begins on page 166)

the same pump operating at successively lower capacities. Another involves a change in flow rate to meet a varying liquid condition, such as viscosity, as in unloading heated tankers of high-viscosity liquids like molasses. A third use is in liquid proportioning.

The Vari-Flo is currently offered in 2-, 3- and 4-in. sizes, providing capacities to 450 gpm, designed to handle liquids up to 85,000 ssu, operate at a maximum differential pressure of 100 psi. There are four types of pumps in each size. Two are external ball-bearing units with mechanical seals, one fitted for handling commercial solvents. The other two are packing-gland pumps for higher temperatures and viscosities; one is offered with steam-jacketed heads. Data given in Bulletin 600. Blackmer Pump Co.

▲ For details, circle 66 on Post Card

ALUMINUM HAND HOISTS are strong, light in weight

Aluminum Safeway Hand Hoists use aluminum in non-load carrying components to decrease weight; load-bearing parts are shock-resistant alloy steel. Aluminum has replaced heavy steel covers, hand chain, chain guide

and nut, to provide a lighter, more easily portable hoist. Self lubricating, the hoist needs only an occasional refilling of oil reservoir. Capacities are from ½ to 4 tons, the smallest model weighing only 35 lb, the largest, 117 lb. Wright Hoist Div., American Chain & Cable Co., Inc.

▲ For details, circle 67 on Post Card

MERCURY ARC TUBE gives more light for money

Plants using mercury vapor lighting will get more illumination for their money with this improved lamp. Originally incorporated in 400-w mercury vapor lamps, the lifeguard arc tube

Steam trap dependability is a matter of what the manufacturer puts into the trap

ARMSTRONG TRAPS ARE DESIGNED AND MADE TO GIVE YOU DEPENDABILITY

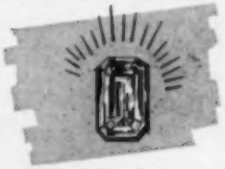
1. Efficient, proved operating principle

Armstrong Traps provide the most advanced development of the time-proven inverted bucket principle. Simple, but effective, there isn't much that can go wrong.

2. Good design

Armstrong Trap design gives big capacity in a small package. The mechanism is virtually fool-proof. All body styles are easy to inspect and maintain without removal from the line.

3. Highest quality materials of construction



Only the best goes into Armstrong Traps. Bodies are close grained 30,000 tensile iron castings or high quality forgings. Working parts are all tough, corrosion resistant stainless steel.

4. Good workmanship

Armstrong Traps are made by craftsmen who take pride in their work. Careful inspection and frequent checking insure the quality of the trap.

5. Application know-how

Your problem has probably been solved already in the extensive experience of the Armstrong engineering and sales organization. You can be sure of sound, dependable recommendations.

Your local Armstrong Representative can show you what Armstrong dependability can do for you. Call him today or write direct.

860 Series for low pressure heating service.

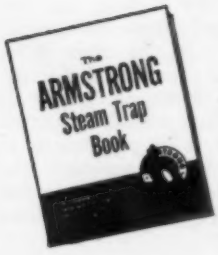
800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.



The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS

9122 Maple Street Three Rivers, Michigan

See our Catalog in Sweet's Plant Engineering File

For more facts circle 632 on Reply Card

ROTOJET®
Cleans TUBES and PIPES
ANY SIZE
from ½" to 12" I.D.
STRAIGHT or CURVED

Roto engineers are constantly designing new equipment to meet new conditions and applications for its tube cleaners. If you have a pipe or tube cleaning problem, we will be pleased to place our long specialized experience at your disposal. Write, wire or

Phone HUmboldt 3-0570

Illustrated are a few of the many types and sizes of Rotojet Tube Cleaners driven by air, steam or water. We analyze each application before recommending equipment that best meets the requirement.

ELLIOTT COMPANY – ROTO PLANT
Tube Cleaner Specialists Since 1910
149 Sussex Avenue, Newark, N. J.
For more facts circle 633 on Reply Card

EQUIPMENT

(Begins on page 166)

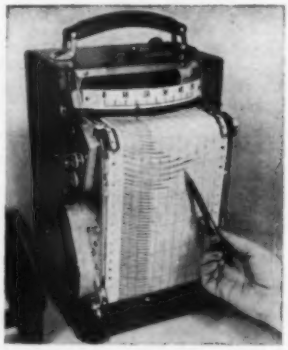
containing an electrode which drastically reduces blackening of arc tube, will be used in 175-, 250-, 425-, 700- and 1000-w mercury lamps. According to company, the new arc tube provides up to 20 percent additional light throughout the life of the lamp. Lamps with the new construction have a rating of over 40 per cent longer useful life.

The electrode in the Lifeguard arc tube uses a new chemical formula and the material is embedded inside the electrode, shielded from electric arc discharge. In this way it is protected from being eroded away. As a result less material is deposited on the quartz arc tube during burning and more light being produced gets through the lamp and is usable. Electrodes in a mercury lamp serve as terminals for light-giving arc. Westinghouse Electric Corp.

▲ For details, circle 68 on Post Card

TIME-SPEED RECORDER spots hidden machine trouble

This graphic recording instrument is designed to help spot hidden trouble in machine operations and processes by timing short duration events to millisecond accuracy, even at slow chart speeds. It is claimed the only in-



strument of its type for monitoring automated operations that provides split-second timing with "time-of-day" information. Time markings along edge of the chart show time of day any event occurs while sweep of the recording pen across the chart shows duration of the event. Timing is accomplished by closing or opening an electrical control circuit. Standard chart speeds of ¾ in. per hour up to 12 in. per minute are provided. The recorder operates on 115 v, 60 cycles, costs under $1000 with accessories. R. B. Annis Co.

▲ For details, circle 69 on Post Card

Select from full lines to operate and control a single OEM product . . . or a plant's entire production line!

Air circuits perform no better than each component. In addition to quality air cylinders and valves, you need accessories of proven reliability. Schrader has them in full lines to make compact, rugged air systems that will install easily, perform tirelessly. See your Schrader distributor who has everything you need, plus factory-trained experts to give you ideas and assistance.

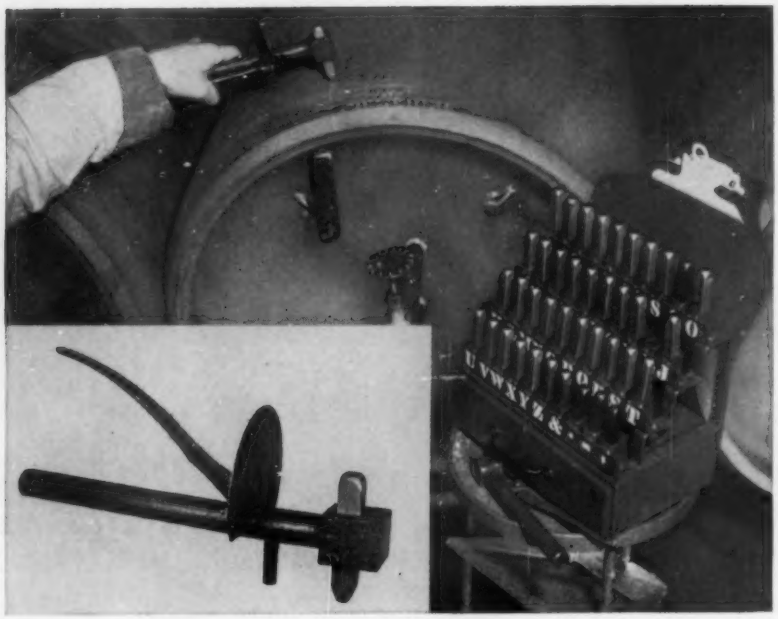
The complete range of sizes and types of air circuitry products is stocked and cataloged by your Schrader distributor. Consult the yellow pages or write Schrader.

Schrader®
a division of SCOVILL

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
484 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

For more facts circle 634 on Reply Card



STAMPING TIME CUT 50% WITH 100% SAFETY

The Pannier Rap-it-safe style single stamp holder cuts stamping time at least 50% . . . while entirely eliminating hand and finger injuries to the stamper. The holder keeps the worker's hand safely out of range of the hammer blow, thus adding to the confidence in his swing. The built-in guard protects the worker's hand effectively. The Rap-it-safe holder gives the worker a clear, unobstructed view of the stamp, permitting accurate placement. The impressions are clearer and more legible when this holder is used.

The Pannier Rap-it-safe holder is designed for fast, accurate heavy-duty stamping of steel boilers, tanks, plates or other products requiring multicharacter legends. Up to 13 characters per minute can be stamped accurately, depending on the operator.

The letters and figures, available in various sizes, are kept in the Pannier Stamp Rack, which has room for 40 characters. The stamps are held in individual slots, which keep them separate and easily identifiable. The stamps in their slots are convenient and ready to use. The Pannier Stamp Rack has a clamp board attached for holding the copy at an easily-seen height.

As each character is to be used, it is picked out of its slot in the stamp rack by gripping it with the holder. Squeezing the handle grips the single stamp firmly in the holder by positive pressure. After use, the character is replaced in its position in the stamp rack. When the handle is released, the stamp releases quickly, and the operator is ready to proceed with the next character.

Pannier engineers will be glad to consult with you on all your marking problems. For complete information, write:

PANNIER MASTER MARKERS

510 Pannier Building, Pittsburgh 12, Pa.

MASTER PANNIER MARKERS

For more facts circle 635 on Reply Card

New Plant Construction

(Continued from page 158)

Dressler Corp., Swissvale, Pa., is scheduled to start construction of the kilns in about 30 days.

Ponce, P. R.—Union Carbide Corp., 30 East 42nd Street, New York, N. Y., has authorized plans for the construction of a large plant at Ponce, Puerto Rico, for the production of polyethylene plastic. Plant will be designed to have an annual capacity of 110 million lb. New plant will go into production the second half of 1962 and will be erected adjacent to an existing plant of the company now engaged in the manufacture of ethylene glycol.

Carrollton, Texas—Southland Battery Company has purchased 40 acres of land here, a suburb of Dallas, Texas, where it plans to construct a $1-million plant for the manufacture of batteries of all types. Work on the new facility will get under way at once and will be ready for occupancy in mid-1961.

Pasadena, Texas — Sinclair-Koppers Chemical Company has awarded a contract to the Badger Manufacturing Co., Cambridge, Mass., for the design, engineering and construction of its new styrene monomer plant to be constructed here. New plant, with a design capacity of 70 million lb annually, will be the largest of its kind and is the first licensed by Cosden Petroleum Corp., under its "styrene from gasoline" process developed jointly by Cosden and Badger.

Port Arthur, Texas—The Texas Co., Chrysler Towers, New York, N. Y., plans to construct a large research center at its largest domestic refinery, located here. Work on the center will begin at once and will be completed in 1965 at a reported cost in excess of $7.5 million. The research center will occupy 35.2 acres of land and will include 15 separate laboratory and office buildings, service buildings and enclosed storage areas.

Richmond, Va.—E. I. du Pont de Nemours & Co., Textile Fibers Department, Nemours Building, Wilmington, Del., is planning new facilities here that will more than double production of nylon yarn for tire cord and other industrial products. Plans call for the installation of additional nylon producing units as well as increasing the production of the existing plant which went into operation two years ago. Expansion will be completed in 1961.

Atlantic City, Wyo.—The Columbia-Geneva Division of U. S. Steel Corp., Russ Building, San Francisco, Calif., will begin construction at once on an iron ore mining and processing plant in southeastern Wyoming, near here. New facilities will be capable of turning out about 4000 tons of high grade iron ore pellets each operating day.

GOULDS PUMPS, INC.

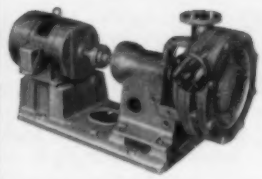
DEPT. PE-80, SENECA FALLS, NEW YORK

Specialists in Pumps!

The largest plant of its kind in the world *plus* over 100 years' experience in pump manufacturing—that's what equips Goulds to answer all your liquid-handling needs. We'll build you a pump specially for your job or draw from our wide line of standard pumps to supply you. Complete details on any pump are available in the Bulletins indicated. Write for your copy.

ATLANTA • BOSTON • BUFFALO • CHICAGO • HOUSTON • NEW YORK • PHILADELPHIA • PITTSBURGH • SHREVEPORT • TULSA • REPRESENTATIVES EVERYWHERE

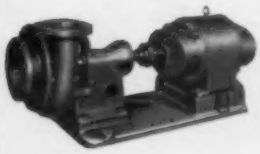
GOULDS-PFAUDLER GLASSED PUMP



Revolutionary new pump designed for handling corrosive liquids. All parts in contact with liquid are glass—fused to metal. Handles all acids except hydrofluoric, and all alkalies to pH 12. Four sizes, with capacities to 700 GPM, heads to 140 ft.

FIG. 3708 — BULLETIN 725.2.

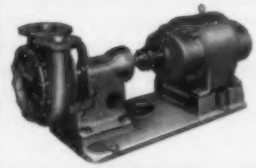
SINGLE-STAGE CENTRIFUGALS



Highly efficient open impeller pumps available in 13 sizes for both motor and belt drives. Capacities up to 3000 GPM, with heads up to 180 ft. at 1750 RPM. Well suited for irrigation, general industrial processes, and slurries.

FIG. 3189 — BULLETIN 720.4.

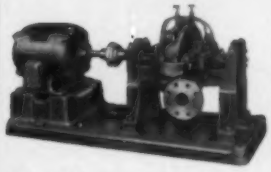
SPECIAL METAL CHEMICAL PUMPS



Available in stainless steel, aluminum-bronze, etc. Motor- and belt-driven, for handling corrosive liquids, food products, chemicals. Handle liquids to 350° F., with cooling of head and quenching of gland. Ten sizes, with capacities to 720 GPM, heads to 200 ft.

FIG. 3715 — BULLETIN 725.4.

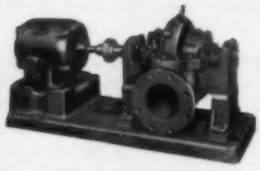
TWO-STAGE CENTRIFUGALS



Eight sizes provide heads up to 1000 ft., capacities to 1200 GPM, depending on heads. Horizontally split casing. Opposed impellers, with labyrinth diaphragm for maintaining thrust balance.

FIG. 3305 — BULLETIN 722.6.

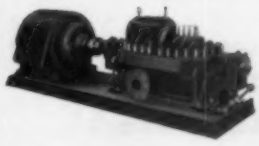
DOUBLE-SUCTION CENTRIFUGALS



Capacities from 200 to 6400 GPM. Heads up to 425 ft. Three shaft and rotating parts assemblies provide for 66 sizes and 132 pump combinations. Horizontally split casing.

FIG. 3405 — BULLETIN 721.6.

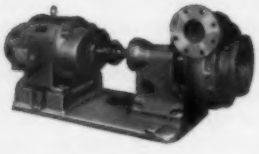
MULTI-STAGE CENTRIFUGALS



Medium- and high-pressure multi-stage pumps. Fig. 3330 is furnished in sizes from 3 to 8 inches, up to 6 stages, with capacities ranging from 40 to 2000 GPM, heads to 850 ft. Fig. 3360 furnished in 3, 4, 6, and 8 inch sizes, up to 8 stages, with capacities ranging from 50 to 2250 GPM, heads to 3050 ft.

FIGS. 3330-3360 — BULLETINS 722.1 and 722.4.

"SUPPORT HEAD" CENTRIFUGALS



Built in 24 sizes, with capacities up to 4000 GPM and heads up to 400 ft. Designed for standard electric motor drive; readily adaptable for belt drive. A substantially built line for general and special applications with many new improvements.

FIG. 3755 — BULLETIN 715.1.

MODULAR VERTICAL PUMPS

SUMP

For pit depths to 20 ft. in 6 inch increments. Both wet and dry pit types available in capacities up to 3180 GPM, heads to 290 ft. Single and duplex units. Full automatic control. Modern design using standard parts permits quick shipment at most economical cost.

BULLETIN 726.2.

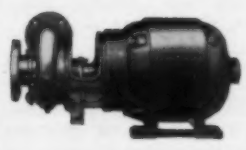
PROCESS

Especially designed for handling corrosive liquids in the chemical process and allied industries. Normally supplied in 316 stainless steel construction but materials to suit user's requirements can be furnished on application.

Capacities to 720 GPM. Heads to 190 ft. For heavy-duty service under most severe applications.

BULLETIN 727.1.

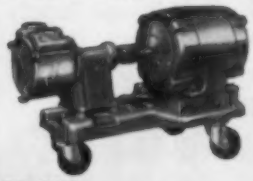
CLOSE-CUPLD CENTRIFUGALS



Single-stage pumps built in 23 sizes with a capacity range from 5 to 2000 GPM and heads up to 400 ft. Embody top horizontal discharge, closed impeller, machined stuffing box, fully protected shaft. Wearing parts easily renewable.

FIG. 3655 — BULLETIN 710.1.

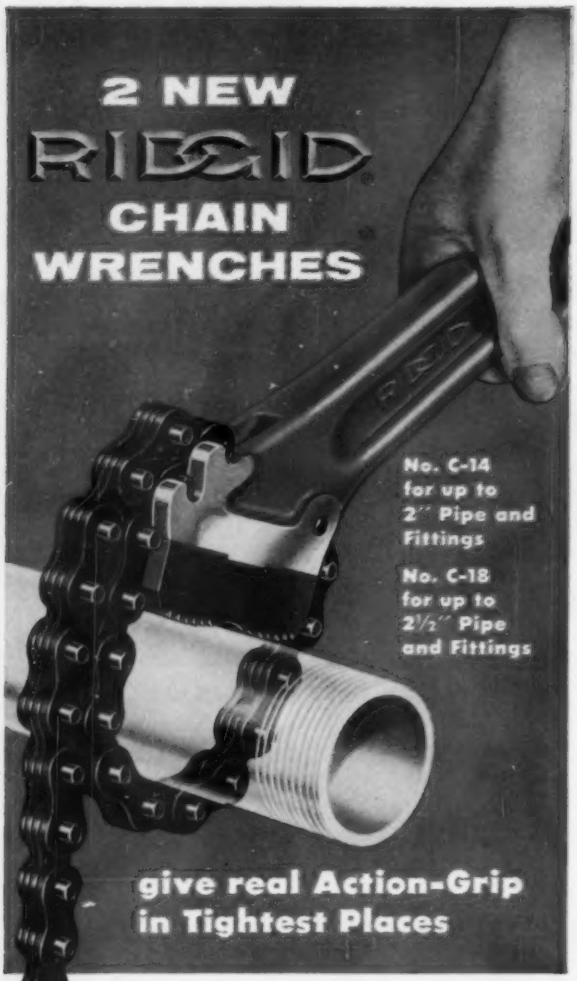
CENTRIPETAL SCAVENGER PUMP



Centripetal action lets it pump liquid, air, liquid *and* air. Use it for transfer, cleaning-up, or pilot plant operations. Compact, lightweight, portable. All-iron or stainless steel construction. Capacities to 60 GPM, heads to 80 ft.

FIG. 2520 — BULLETIN 725.6.

For more facts circle 636 on Reply Card



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Light and easy to use, these new RIDGID Chain Wrenches do everything a regular wrench can do . . . and much more. Call your Supply House and get one today!

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NEW BOOKS for the plant engineer

Time-Saving Estimating Guide

PLUMBING, HEATING, and PIPING ESTIMATOR'S GUIDE. Size 8¼ by 5⅛ in.; 213 pp including index; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. Price $6.50.

THE EXPERIENCE of a seasoned estimator is reflected in this book which contains many time-saving tables along with informative text material and sample bid forms.

Flexibility is incorporated into the labor factor tables to take care of a variety of conditions that may be experienced on jobs. This is done through the use of an efficiency factor, "E" which gets a value of 1 for average conditions.

If above average conditions are expected, then the factor becomes greater than 1. How much greater depends on what may be reasonably expected. On the contrary, if conditions are better than average then the factor will be less than 1.

In the labor factor tables, man-hours are listed under various efficiency factors. If the estimator, referring to any of the tables feels that the man-hour figures under the average efficiency factor are not representative of conditions in his case, he can alter man-hour estimate and change other figures by simple multiplication.

In this publication the author, a registered engineer, brings out numerous facets which may enter the plumbing, heating and piping estimating picture. For example, some of the items discussed relating to plumbing are: trench excavation, timbering and protection, foundations, hangers, inserts, sleeves, and water heating equipment.

On Time and Motion for Work Improvement

WORK IMPROVEMENT BY GUY C. CLOSE, JR. Size 9¼ by 6 in.; 388 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Park Avenue South, New York 16, N. Y. Price $7.75.

IN THE INTRODUCTORY chapter of this book, the author discusses the significance of work improvement and also comments on the meaning of the position of supervisor. The chapter that follows contains background material on the men behind the scientific approach. A factor of importance in work improvement is the attitude of questioning pertaining to methods and procedures. This is the third and last topic treated in the first main portion of the book.

Topics of the other four text divisions are: defining the problem; tools for analysis; methods for improvement; and getting action. Among the subjects explored in these book sections are the following: areas for improvement; work distribution and sampling; creativity; office procedures; installation—a problem in human motivation; and suggestion plans.

An Aid for Electrical Systems Design

ELECTRICAL SYSTEMS DESIGN. Second edition; size 11¼ by 8½ in.; 208 pp including index; illustrated; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. Price $7.75

THIS PRACTICAL guidebook deals with design details of electrical systems falling in such application areas as power, lighting, heating and air conditioning, and signalling and communications. Material in the book pertains to commercial, industrial, institutional and residential uses.

Many wiring diagrams appear in this book which also

includes convenient tabulated information. In the early part of the book applications of branch wires with the different types of insulations are listed as well as those for common cable assemblies for use in branch circuits.

In a section on the distribution system consideration has been given to such topics as feeder design, motor feeders, switchboards and panelboards, load-center substations, and wireways.

Lighting design is treated as a ten-step approach starting with problem analysis and ending with a discussion of a check for practicality. In the lighting portion of the book the new footcandle levels are presented stemming from a study of the Blackwell Report.

In the appendix a discussion reflects on the changes in the 1959 National Electrical Code. A listing of code numbers of the 1959 edition cross indexed with those of the 1956 code is included and changes are denoted by bold figures.

Insight on Engine Technology

THE INTERNAL COMBUSTION ENGINE—in Theory and Practice by Chas. F. Taylor. Size 6⅛ by 9¼ in.; 576 pp including index; illustrated; cloth bound. Available from John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price $16.00.

AUTHORED BY a faculty member of the Massachusetts Institute of Technology, this book is the first of an over-all two volume presentation relating to the internal combustion engine. For fuller appreciation of the contents a working knowledge of calculus is recommended.

In this book discussion on the air cycle leads up to material on the thermodynamics of actual working fluids and fuel-air "cycles." This is followed by a study of the actual cycle including passages on pressure and temperature measurements.

Air capacity of four-stroke engines, heat losses, two stroke engines, friction, lubrication, wear, influence of cylinder size on engine performance, are some of the other principal topics of discussion. Included in the appendixed material are symbols and their definitions, and listings, by chapter, of reference material.

A Report on High Temperature Water

HIGH TEMPERATURE WATER for Heating and Light Process Loads. Size 11 by 8½ in.; 92 pp, illustrated; 1959 publication; paper bound. Available from National Academy of Sciences-National Research Council, 2101 Constitution Ave., Washington 25, D. C. Price $2.00.

A GROUP of individuals from various U. S. government agencies made a study of High Temperature water which resulted in the publication of this Federal Construction Council Report No. 37. Engineering firms and manufacturers had an important part in the task group's efforts to gather material on this subject.

There are three principal sections to this report. The first deals with objectives, scope and study methods. The second takes in recommendations and includes material on such items as hot water generators, expansion vessels, pumps, controls, and space and process heating equipment.

The third section contains supporting information. In this portion of the report passages on type of systems, system water velocities operating temperatures and pressures and distribution circuits are presented as well as discussions of the same subjects that are treated in the section on recommendations.

One of the two appendices carries a comparison of the use of steam and high temperature water. In the other one is a list of companies whose representatives attended meetings in Washington on the high temperature water topic.

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Double engagement and floating shaft types provide a wide range of adaptability to design requirements. Performance has been proved and approved in thousands of installations involving high torque, adjustability, weaving structures and other difficult conditions.

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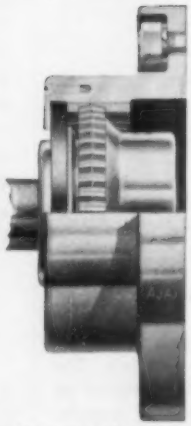

Cut-away view shows typical arrangement of Ajax Dihedral gears specially designed for handling angular and offset shafts.

AJAX FLEXIBLE COUPLING CO. INC.

100 Portage Road, Westfield, N. Y.

In Canada—The Alexander Fleck, Ltd., Ottawa

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GM Conserves Water

(Continued from page 99)

ors has more than doubled in this plant since 1954, but sensible design of equipment resulted in no increase in water use. Hydraulic oil coolers have been completely redesigned to use minimum amounts of water, and automatic control systems for makeup water in washers have been installed.

In 1957 eleven additional die casting machines were installed but the use of closed water recirculating systems prevented any increase in water consumption for the plant.

In spite of the continually increasing installation of water-using equipment and expanding floor space in the plant, water consumption for this operation is steadily declining. Constant attention to detail in water conservation and the development of a water savings attitude in the plant personnel dropped water usage from an average of 2,300,000 gallons per day in 1949 to a 1958 figure of 800,000 gallons per day. See Fig. 6.

From the actual plant experiences cited, it is evident that close attention to control of water in the plant can result in greatly lowered consumption. This benefits both community and manufacturer from at least three standpoints—making more water available to others, reducing the load on sewer system, and lowering the cost of manufacturing. **End**

Centrifugal Separators

(Continued from page 106)

be kept from contact with air. In the case of volatile materials, losses due to flashing or evaporation can be greatly reduced.

Vegetable oil processors, in particular, are reaping many benefits through use of hermetic centrifuges. They make refining and degumming operations more efficient and produce higher oil yields. Also, because the feed materials are maintained under pressure within the bowl, more viscous soap and gums are obtained and are easily discharged. This equipment provides a new approach to soda ash refining in that soda ash solutions can be reacted

"Puritan Engineered Maintenance boosted our cleaning standards 30%—reduced costs 20%!"

"We produce a line of highly sensitive electromechanical meter-relays, panel meters, and complete controls," says Mr. John Saint-Amour, President of Assembly Products, Inc., Chesterland, Ohio. "To maintain proper control over quality, our production and assembly areas must be as clean and as free of dust as possible. As a result, we have always placed unusual stress on maintaining good housekeeping and sanitation 'practices'."

"This is why we immediately recognized the advantages offered by Puritan Engineered Maintenance. It allowed us to put plant housekeeping on a scientific basis; spelled out how, when and where to do the job; gave direction to our cleaning operations; provided standards and instruction for our custodians; and it set up regular inspection procedures to keep our standards up to par."

"But the end results of Puritan Engineered Maintenance were even more gratifying. We've raised our existing levels of housekeeping one-third—have seen a startling increase in the efficiency of our custodial staff—and best of all, have accomplished all this at 20% less cost!"

Survey. In setting up Assembly Products' program, Puritan first made a detailed survey of the premises—pinpointed jobs to be done.

Program. A custom designed Engineered Maintenance Program was prepared. Details were explained to management and supervisors.

Training. Individual custodial responsibilities were explained. Training in scientific cleaning techniques was undertaken.

Inspection. Regular inspections spot trouble areas and uncover any other problems. Corrective measures can be undertaken immediately.

Whether your sanitation standards must be maintained at peak levels—or whether your operations simply call for normal, efficient housekeeping—chances are, you'll benefit from Puritan Engineered Maintenance. This unique service is available, without charge, to users of Puritan sanitary maintenance supplies. Why not get details today?

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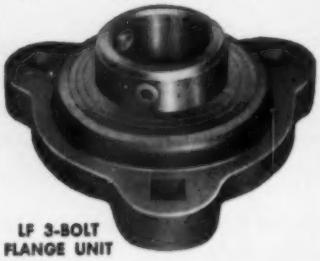

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Available in pillow blocks and two or three bolt flange units for flush or recessed mounting. All units in the "L" Series available with the new SEALMASTER contact type seal.

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LF FLANGE UNIT

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Centrifugal Separators

with oil and separated without the usual dehydration or gas removal step. Again, because it operates under pressure, carbon dioxide is not given off during the reaction and separation of the soapstock from the oil. In other industries, the hermetic separator is used to clarify such materials as synthetic latex and viscous cellulose acetate dissolved in solvent.

Concentration and removal of solids from a slurry or suspension is a specialty of the conveyor bowl centrifuge. It is particularly applicable where the slurry is too thick for other types of separator. It is often used for the removal of a high concentration of solids from a liquid before further purification. It is also of great value where the solids themselves are the desired end product of the separation.

There are two basic types of conveyor bowl centrifuge: one is conical and the other is cylindrical. In both types, the bowl rotates on a horizontal axis and a screw conveyor inside the bowl rotates in the same direction but at a lower speed. In effect, the centrifugal force on the feed material throws it outward to the bowl wall and the screw device carries accumulated solids to the end of the centrifuge where they are discharged. The clarified liquid is discharged through a separate port.

The cylindrical unit is used to process solids which are relatively soft or plastic and have a low angle of repose. It performs particularly well with solids which do not pack tightly but which dry to a degree by compression rather than draining. It is used when the dryness of the solids is not the chief concern. The bowl volume is larger than that of the conical bowl type. Consequently, the liquid is exposed to centrifugal force for a longer time and there is usually a greater degree of clarification of the discharged liquid.

Conical bowl units are used to process solids which pack tightly and have a high angle of repose. They are especially suited for applications where the discharged solids are desired in a dry state. This machine combines the functions of sedimentation, separation and draining. **End**

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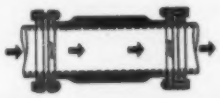
PINCH VALVES

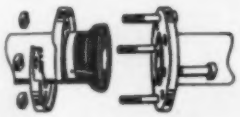
RUBBER, NEOPRENE
for Corrosion and Abrasion

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.



- Split flanges and patented Flex Seal ends ensure perfect seal.
- Closing mechanisms... manual handwheel; handwheel with chain and sprocket reduction unit; electric worm gear motor reducer; chain operated torque arm reducer; hydraulic air-hydraulic.

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For more facts circle 642 on Reply Card

Air operates this folding machine to provide the neatly folded, factory-fresh shirts found in popular shirt stores. In the background, left, is an air- and steam-operated pressing machine that furnishes smoothly pressed shirts in seconds.

Compact 25S2 distributes air through 2-inch air-mains and laterals to individual machines. Mr. Hopper, (at right), expects "many years of trouble-free service from the Model 25S2 compressor."

Van Heusen "cuts operator fatigue—ups output per machine by 10% to 20%" with a

LE ROI 25-HP STATIONARY COMPRESSOR

Shirt-making is exacting work. It's so tiring that an operator's output can drop 40% in five hours. To reduce fatigue and to maintain efficiency, "we prefer air control for the more delicate operations of sewing and trimming machines, laundry, pressing and creasing work," reports Charles G. Hopper, assistant to the production manager of the Pottsville (Pa.) plant of Phillips-Van Heusen Corp.

At least some of the credit for reducing fatigue and increasing production is given to the 25 horsepower Le Roi compressor which provides air-power in their shirt factory.

The 105 cfm, 125 psi capacity of the Le Roi 25S2 air-cooled compressor more than meets current needs, and provides for the addition of more air-operated machines. Mr. Hopper states that the unit operates 10 hours a day, five and one-half days a week. To assure dependable air supply, valves of the 25S2 are inspected weekly, and oil is changed every 200 hours.

Why don't you check the benefits of pneumatic operation? Le Roi can meet your needs with Westinghouse unit-type and Le Roi stationary air compressors from ½ to 100 hp. See your Le Roi distributor for more information. Or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

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With or without pipe flanges.

Exclusive features of NEW Wilkerson "WHIRLFLO"

★ Metal bowl or transparent bowl.

★ "Micro-Pruf" cartridge completely removes oil and particles as small as 3 microns—lasts 4 times longer.

★ 200% greater CFM capacity. Maximum pressure 250 PSI with metal bowl.

Put the "WHIRLFLO'S" double-barreled action to work for you.

1. Centrifugal force from special baffle vane sends contaminants to walls of cylinder away from cartridge from where they drain into sump.
2. Then separated air flows through "Micro-Pruf" cartridge. This 2-stage action cleans better and adds months of life to cartridge.

SAVE
on maintenance and operation.

1. The cartridge lasts 4 times longer than others.
2. Cartridge is easily replaced by removing one nut while unit remains on pipe line.
3. Addition of automatic petcock eliminates human failure to drain, keeping cartridge from water level.

WRITE TODAY FOR COMPLETE INFORMATION ON THE EFFICIENT, MONEY-SAVING WILKERSON "WHIRLFLO".

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Specifying Plastics?

(Continued from page 117)

voltages without breakdown or arcing. This property is used to determine minimum material thickness for a given electrical potential or as a general rating for electrical insulation.

An electrical insulator when subjected to an arc may burn and leave a carbonized path which would become electrically conductive. Teflon, when subjected to such arcing, converts to a gaseous product without carbonizing and thus can withstand occasional arcing or corona without impairing its insulating properties.

Specific Gravity

Because of the low specific gravities, plastic materials are excellent in engineering applications on a volume weight basis.

Polyethylene and one of the newer plastics, polypropylene, are the only general purpose engineering materials which, in solid form, are lighter than water.

The use of filler materials with any of these basic formulations will considerably modify the specific gravity.

Material Cost

A cost comparison on a poundage basis tends to be unfair to the plastics. On a cost per foot basis or, even more strikingly, on a cost per piece basis, Figs. 9 and 10, a plastic part can be made very competitively with the ferrous and non-ferrous materials. Machining and fabrication is generally less costly with plastics, and their combination of properties permits elimination of components.

There are other valid comparisons for the cost of these materials, such as the cost per pound of load carrying capacity or the cost for a certain degree of stiffness, etc.

The comparison of the price of plastic to metal is more favorable as the quantity increases. Quantity reductions in prices come much earlier in plastic materials than they do with the common metals. For example, the prices shown for plastics, represent in some instances the second and third price plateaus whereas for metals the volume would have to be increased considerably before any change in the price occurred. **End**

"SEXAUER"
EASY-TITE
Note imbedded Nylon plug — locks screws automatically
Note Fiberglas backing — resists closing squeeze

New Way to Stop Faucet Leaks!

★ **9-in-10 washers are fastened with TOO LONG or SHORT SCREWS thus loosen and destroy themselves. Leaks quickly follow!**

34 YEARS OF RESEARCH REVEALS NEW SOLUTION

★ **New, patented 'Sexauer' SELF-LOCK screws have imbedded expanding NYLON PLUG. They lock at required depth AUTOMATICALLY, hold washers firmly! Made of MONEL, they are rustproof, non-corroding. Heads can't twist off. Screw slots can't distort.**

★ **NEW, improved 'Sexauer' EASY-TITE faucet washers are made of super-tough, pliable du Pont compound (not rubber or fibre). Reinforced, like a tire, with a vulcanized layer of Fiberglas, they resist distortion and splitting from shut-off grind and squeeze.**

★ **Faucet leaks repaired with 'Sexauer' EASY-TITE washers and SELF-LOCK screws out-last ordinary repairs "6-to-1"!**

HIDDEN COSTS OF FAUCET LEAKS!

Hackensack, N.J. Water Co. and American Gas Association figures prove stopping just ONE PIN-HOLE SIZE (1/32") LEAK saves you 8,000 gal. water quarterly. A HOT WATER FAUCET LEAK repair saves you over $7.58 QUARTERLY in fuel and water bills. Fewer leaks also produce important savings on MATERIALS, LABOR and COSTLY FIXTURE REPLACEMENTS!

A 'Sexauer' Technician will make available our NEW Catalog, Edition "J", listing our entire line of over 3,000 TRIPLE-WEAR plumbing repair parts and tools. He will survey your fixtures, determine the repair parts needed and establish an efficient stock arrangement and control to prevent costly overstocking or shortages. You get this service without obligation. *Act now!*

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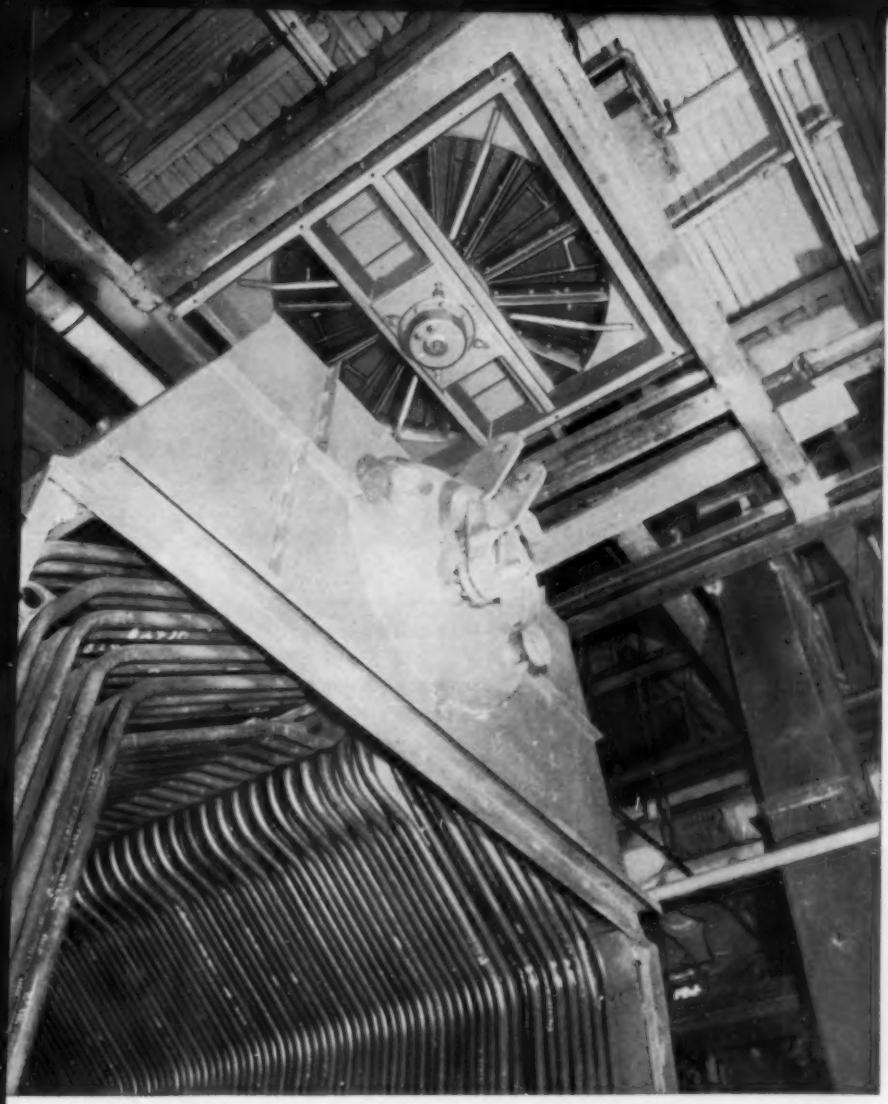

The Ljungstrom Air Preheater at the B. F. Goodrich Company Shelton Plant is installed directly over the 65,000 lb/hr Wickes boiler. Flue gas leaving the boiler at 615°F passes through the circular rotor, which absorbs the heat and releases it into the incoming air. Preheated combustion air improves combustion, makes fuel burn cleanly. This Package Air Preheater was factory-assembled, and requird only 100 manhours to install.

At B. F. Goodrich Co.'s Shelton Plant

Air Preheater boosts combustion air temperature 345°F... gives 6% more thermal efficiency

"Only a Ljungstrom® Air Preheater, with its continuous regenerative principle, could meet our requirements", says A. G. Sandomirsky, Manager of Engineering at the B. F. Goodrich Company, Shelton, Conn., plant. "We produce foam rubber 24 hours a day, five and six days a week. With an Air Preheater we can meet process steam requirements more economically, and an Air Preheater helped us to justify the installation of high efficiency, high pressure equipment for by-product power generation."

Here's why the Shelton plant meets its requirements best with a Ljungstrom Air Preheater:

1. Ljungstrom is the most efficient heat exchanger you can buy. The Ljungstrom rotor revolves continuously through the flue gas and incoming air, thus absorbing heat and releasing it *from the same surface*. Since the heat doesn't have to pass through anything, each inch of rotor surface is as efficient as one foot of a tubular recuperator.

2. Ljungstrom is the most reliable heat exchanger you can buy. All heat exchange elements pass through the entire air and gas streams. The temperature of the elements in the coolest region – where fresh air enters – is actually an average of the gas and air temperatures, so it's consistently higher than the coolest point in a recuperative heat exchanger. Result: no cold spots, less chance of moisture formation.

3. Ljungstrom is easiest to maintain. You can inspect it – and clean it–while it's running. Heat exchange elements are divided into modular baskets that can be replaced individually without disturbing the other elements. You can even reverse the elements if the surface has thinned on one edge, effectively doubling the life of the heat exchange surface.

For more information on the Ljungstrom continuous regenerative principle, or on the Air Preheater that meets your requirements, phone MUrray Hill 2-8250 or write to The Air Preheater Corporation.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

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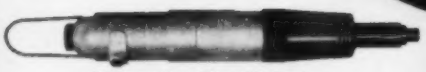
CLECOMATIC

the automatic torque control tools that made industry stop, look and examine their methods of setting screws, nuts, and bolts.



Clecomatic No. 10 Series Screwdriver- Nut-Runner

Clecomatic Right Angle Nut-Runner

Clecomatic* No. 10 Series Screwdriver—Nut-Runner: These are the tools that enable you to set torque to the most critical specifications . . . then forget it. Torque is positively maintained by a no-drift locking device. A long wearing, non-friction clutch is quickly adjusted when torque change is desired. *This is the only torque control air tool that starts and stops automatically!* Operator merely engages the screw with bit, the tool starts. When torque is reached, the tool stops. Motor operates only during rundown. Less air is used. Wear is reduced. There is no quality let-down at the end of a shift because control is in the tool. This tool has little impact, is shorter, and weighs less than competitive tools. No. 10 Clecomatic Screwdriver—Nut-Runners are available in pistol grip or straight handles in speeds from 400 to 2,900 r.p.m. Reversible or non-reversible.

Clecomatic Right Angle Nut-Runners: You get uniform tightness in every nut or bolt rundown with a Clecomatic 14 or 16 Series Nut-Runner. Torque is preset. When specified foot pounds are reached, air is automatically shut-off at the driving spindle. The hazardous, tiring torque kick usually found in tools of this type is substantially reduced, your operators can produce more without extra effort. As for maintenance, there's practically none. Cleco's non-friction clutch operates for very long periods, completely maintenance free. Torque adjustment is made externally, no need to disassemble the tool. Clecomatic Nut-Runners are available with both recessed socket heads and double-end spindles (reversible). Speeds range from 250 to 1,000 r.p.m.

NOW AVAILABLE! Clecomatic No. 6 Series Screwdriver—Nut-Runners: Essentially the same tool as the Clecomatic No. 10 Series—but smaller and lighter. No. 6 Series is equipped with the same unique torque control principle. The same automatic start and stop mechanism. They enable you to make even greater cost savings in the production line operations of automotive, aircraft, appliance, and electronic industries. Clecomatic No. 6 Series Screwdriver—**Nut-Runners are available for delivery.**

To find out how big an improvement a Clecomatic can make in your operation, call your local Cleco® representative for a tryout-demonstration. For detailed literature, write:

CLECO
AIR TOOLS

A Division of REED ROLLER BIT COMPANY
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IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd.
927 Millwood Road, Leaside (Toronto), Ontario

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BULLETINS

(Begins on page 23)

LUBRICATION

Industrial Lubricants—Performance of SCL (sulfo-chloro-lead) industrial lubricants is detailed in 12-pp Lube-Report 102. Includes case histories of application in four steel plants as well as information on properties, selection. The Elco Lubricant Corp.
▲ For a copy, circle 147 on Post Card

Extreme-Pressure Lubricant—Properties and applications of a semifluid extreme-pressure lubricant are detailed in Technical Bulletin 64. Specification data included. Sun Oil Co.
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Gear, Bearing Lubricants—Characteristics and performance of gear and bearing lubricants are detailed in this 8-pp bulletin. Describes characteristics of Almasol ingredient and tells hows to evaluate lubricants. Lubrication Engineers, Inc.
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Additive Test Data—Lube/Report 101, 12 pp, is a technical report giving results of tests to evaluate SCL concentrate as a grease additive in comparison with two other additives in which all three were tested in major types of greases. Includes photos showing moisture corrosion test comparisons. The Elco Lubricant Corp.
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MAINTENANCE

Building Maintenance—This 28-pp manual provides detailed information on modern methods and materials for building maintenance. Includes section on cleaning and finishing floors and a chart explains characteristics of 12 different floor surfaces. S. C. Johnson & Son, Inc.
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Vacuum Cleaning Tools—Twelve-pp Bulletin E073 presents new tools for central vacuum cleaning systems. Included are nozzles, floor brushes, and tools, wall and floor handles and brushes, also hose, valves and fittings. Price data provided. Lamson Corp.
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Steam Cleaners—This 12-pp catalog illustrates and describes steam cleaners and hydraulic pressure combination cleaning systems. Detailed specifications on each model included. Malsbary Mfg. Co.
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Urethane Coatings—Twelve clear urethane coatings are described in this information file, No. 160, for use where varnishes or lacquers have previously been used as finishes or protective coatings. A chart provides general, physical, chemical and mechanical properties for each. B. B. Chemical Co.
▲ For a copy, circle 154 on Post Card

Coatings Selector—Charts provided in this folder serve as a guide to specialty coatings for applicaiton on plastics, metals, glass and wood. The charts show uses and characteristics of company's spray, dip and flow coating materials, vacuum metallizing coatings and standard plastisol formulations. Bee Chemical Co.
▲ For a copy, circle 155 on Post Card

WIRE ROPE

Wire Rope Application—Presented in 156-pp Catalog 493 is detailed data on wire rope for construction and industrial equipment. Contains recommendations for use on various types of construction and industrial machinery . . . power shovels, dredges, scrapers, dozers, derricks, hoists, pile drivers, pavers, overhead traveling cranes, etc. Includes basic wire rope information, discusses rope features, grades, construction, lays and cores. Bethlehem Steel Co.
▲ For a copy, circle 156 on Post Card

Elevator Rope Guide—When elevator rope should be retired, lubrication, safety factors, diagrams, and specifications are covered in Book E-10. It is of particular interest to plant engineers concerned with repair and maintenance of passenger and freight elevators. Macwhyte Wire Rope Co.
▲ For a copy, circle 157 on Post Card

TOOLS, WELDING AND MACHINE SHOP

Heavy-Duty Electric Tools—Twelve-pp Condensed Catalog G20 illustrates and describes heavy-duty electric tools, including drills, saws, shears, sawzalls, generators, grinders, hammers, screw drivers, nut runners, sanders and polishers. Detailed specifications included. Milwaukee Electric Tool Corp.
▲ For a copy, circle 159 on Post Card

Hand Tools—Illustrated and described in 16-pp Catalog H-9, are a variety of hand tools, including OTC wrenches, pliers, cutters, screw drivers, punches, chisels, sockets, handles, extensions, socket sets, tool sets, tool chests, and other tools. Dimensional data included. Owatonna Tool Co.
▲ For a copy, circle 160 on Post Card

Manual Welding Equipment—Sixteen-pp Catalog F-1393 describes the Sigmatic welding machines, torches, and controls, for consumable electrode, inert-gas-shielded welding. Covers frame, sled and cart type units, giving features and advantages. Linde Co., Div., Union Carbide Corp.
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For Weld Grinding—Catalog 1724 contains 14-pp of detailed information on grinding wheels for every phase of weld grinding. Properties and uses of various types of grinding wheels are covered, and photos and selection tables included. Norton Co.
▲ For a copy, circle 162 on Post Card

Vest Pocket Welding Guide—This revised edition of "How to Get Better Welds", contains some 80 pp of arc welding information. Covers essentials for proper welding procedures, good and bad welds, welding positions, operator qualifications, welding metals and steel available for welding. Also deals with causes and cures of common welding troubles, check points for quality welding, cost saving, safety precautions. Electrodes and factors to consider when selecting them are discussed, as are welding wires and flux, power sources, training aids. Hobart Brothers Co.
▲ For a copy, circle 163 on Post Card

Arc Welding—Basic information concerning arc welding techniques for small diameter piping is contained in Bulletin 2112.3. Lists advantages of welded piping installations; describes procedures, explaining calculation of welding costs with chart resume of information for Schedule 40 pipe. The Lincoln Electric Co.
▲ For a copy, circle 164 on Post Card

Brazing Techniques—This 24-pp manual contains data for brazing shapes, sheet, castings, tubing and assemblies of aluminum, cast iron, copper, brass and steel. Covers such basic functions as heat, flame and torch settings, alloys selection and joint design. Solutions to common brazing problems are answered. All-State Welding Alloys Co., Inc.
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Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on the facing page.

Soldering Tools—Catalog S-60 contains 8 pp of detailed information on soldering tools featuring interchangeability. A temperature chart for various applications is included. Ungar Electric Tools.
▲ For a copy, circle 166 on Post Card

MECHANICAL POWER TRANSMISSION

Speed Variator—Eight-pp bulletin GEA-7018 describes an adjustable speed drive using the Thyratron tube to convert a-c to d-c power. Illustrates and describes design components; includes dimensional data. General Electric Co.
▲ For a copy, circle 167 on Post Card

Variable-Speed Sheave—Eight-pp Bulletin 6102, has been revised to provide additional technical data and current prices on the SVS variable-speed sheave—a multiple-groove V-belt sheave adjustable to desired pitch by turning a screw. Covers advantages of the sheave, tabulates sizes and includes drive selection information. T. B. Wood's Sons Co.
▲ For a copy, circle 168 on Post Card

Magnetic Particle Clutches—Characteristics of a line of magnetic particle clutches offering low-inertia fast-response for transmission of mechanical power are detailed in this 16-pp bulletin. Curves, installation drawings and other illustrations show various clutches and possible uses. Lear, Inc.
▲ For a copy, circle 169 on Post Card

BULLETINS

(Begins on page 23)

METALS

Titanium Facts—Properties and characteristics of titanium are detailed in Technical Bulletin 100, including charts cataloging types of titanium and alloys, metallurgical properties and other data. Methods of welding titanium by shielded arc, spot, seam and flash methods are also described. Nooter Corp.
▲ For a copy, circle 170 on Post Card

Aluminum Buyers Guide—Contained in 20-pp Technical Bulletin 30-1 are quick facts on aluminum coil, sheet, plate, tubing, pipe, rod and bar available from stock with guide to selection. Aluminum building products, including roofing, siding, thresholds, sills, hand rails, are described, and specifications, analyses, mechanical properties, tolerances, machinability ratings, finishes, included. Joseph T. Ryerson & Son, Inc.
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MACHINERY MOUNTING

Machinery Mountings—Steel spring machinery mounting for vibration, shock and noise control is featured in 6-pp Bulletin K3C. Lists variations available and includes table of capacity. The Korfund Co., Inc.
▲ For a copy, circle 173 on Post Card

Resilient Mountings—Eight-pp Bulletin 905 is an illustrated guide to resilient mountings and mounting systems for vibration, shock and noise control. Includes general design, application and performance data. Lord Mfg. Co.
▲ For a copy, circle 174 on Post Card

Leveling Screws—Detailed information on leveling screws, as well as actual applications, is offered in 6-pp Bulletin 602. Three styles of levelers are illustrated and applications described. The Ohio Nut and Bolt Co.
▲ For a copy, circle 175 on Post Card

ELECTRICAL

Shielded A-C Motors—Comprehensive 56-pp Catalog 200 includes complete dimensional, selection and application data on company's Multi-Shielded a-c motors. Includes information for various modifications, such as specialized mountings and enclosures, as well as multi-shielded drip-proof motors. Sterling Electric Motors, Inc.
▲ For a copy, circle 176 on Post Card

Motor Selector—Eight-pp Bulletin L-1661A lists motor and generator lines available through consolidation of this company and three other manufacturers. Motors range from 1/40 to 300 hp, including standard types in a variety of voltages, speeds, mountings and enclosures, as well as designs for special applications. Also lists gearmotors, speed reducers, frequency changers. Howell Eelectric Motors Co.
▲ For a copy, circle 177 on Post Card

Why New Rating Method—Eight-pp Bulletin GEA-7047 tells how new transformer rating method permits use of more kva with same operating life and same investment. Describes Permalex insulated oil-filled distribution (5 to 500 kva) transformers and network (300 to 2500 kva) units. Discusses new 55C/65C ratings, gives data on loading and changeout practices which take advantage of higher kva capacity. General Electric Co.
▲ For a copy, circle 178 on Post Card

Plug-In Bus Duct—Application data for plug-in bus duct is contained in 28-pp Application Data 30-661. Drawings, dimensions, specifications, and engineering and test data included. Westinghouse Electric Corp.
▲ For a copy, circle 179 on Post Card

Underfloor Raceway Systems—Product illustrations and correlated information for specifying and installing underfloor ducts and service fittings are presented in 12-pp Catalog 36. Includes technical specifications of the systems two sizes of ducts, fittings and duct to conduit adapters. Wheatland Electric Products Co.
▲ For a copy, circle 180 on Post Card

Rigid PVC Conduit—Applications of rigid polyvinyl chloride in the electrical field are detailed in this 20-pp booklet. Included are comprehensive test results, specification information, installation instructions, corrosion resistant charts, and other data on rigid PVC conduit. Kraloy Plastic Pipe Co., Inc.
▲ For a copy, circle 181 on Post Card

Load Center Selector—Booklet GED-3625 is a 48-pp shirt-pocket-size catalog on Twin circuit breaker load centers and meter socket-load centers. Contains wiring diagram and listing of ratings, circuit capacities and other ordering data. Also covers installation and quality features and describes company's new 70- and 100-amp plug-in breakers which reduce material costs by eliminating need for separate main disconnect enclosure. General Electric Co.
▲ For a copy, circle 182 on Post Card

Hook-Operated Switch—Featured in 12-pp Bulletin 1030A is a low cost, full performance, all-purpose hook-operated switch. Describes design and construction features, advantages, and includes dimensional and ordering data. I-T-E Circuit Breaker Co.
▲ For a copy, circle 183 on Post Card

Circuit Breaker Testers—Features and advantages of company's test units in testing low-voltage power circuit breakers and molded case circuit breakers are stressed in 16-pp Bulletin SB-CB-1. Covers typical test procedures, general considerations, selection of proper model, operation of testers, etc. Also discusses breaker maintenance. Multi-Amp Div., Multi-Amp Electronic Corp.
▲ For a copy, circle 184 on Post Card

Alternators, Converters—Bulletin 515-A covers design and availability of high frequency alternators and converters. Describes nine alternators from 1 to 7.5 kva and producing 360 to 3300 cycles. Also covers two types of converters in four ratings from 215 to 10 kw, frequencies from 120 to 420 cycles. Industrial Motor Div., Robbins & Myers, Inc.
▲ For a copy, circle 185 on Post Card

COOLING AND AIR CONDITIONING

Centrifugal Fan Towers—Bulletin ECKB-601 describes centrifugal fan cooling towers for indoor installations requiring ductwork. Table of operating and dimensional data included. Halstead & Mitchell Co.
▲ For a copy, circle 186 on Post Card

Packaged Air Conditioner—Detailed information on packaged air conditioners is presented in 12-pp Bulletin 6022. Cutaway view shows component features and tables list capacity data, specifications. Dunham-Bush, Inc.
▲ For a copy, circle 187 on Post Card

INSTRUMENTS, CONTROLS

Instruments, Controls—Illustrated and described in 14-pp Catalog 4-60 are instruments and controls for industral applications, including continuous level and density controls, level switches, pipeline monitoring, combustion control, backwash filter programmer, others. Solid level controls described include gamma radiation, capacitance, float actuated, electronic, others. Instruments, Inc.
▲ For a copy, circle 188 on Post Card

Control Equipment, Accessories—Catalog 57-S7, 16-pp, on accessories and control equipment covers: break-glass switches, control stations for mechanically held switches and relays, relay panel for gas valve, engine generator isolating switches, transfer switches, and phase sequence correctors. Automatic Switch Co.
▲ For a copy, circle 189 on Post Card

Automation Components—A 30-pp reference for automation components and control systems, Condensed Catalog D-31 describes latest timing components and linear measuring systems for industrial use. Sections are devoted to electronic timers, special timers and applications, package control systems, test equipment, etc. Automatic Timing & Controls, Inc.
▲ For a copy, circle 190 on Post Card

Postage-free cards for ordering bulletins are on page 244. You may also use the cards to order literature mentioned in the ads.

Computer Talk—This 22-pp glossary of "computerese"—the language of electrical brains—is designed to make computer language more intelligible to the layman. Defines over 82 terms found in the vocabulary of industrial process computer engineers. Minneapolis-Honeywell Regulator Co.
▲ For a copy, circle 191 on Post Card

Fluid Flow Rate Alarms—Bulletin 175, describes fluid flow rate alarms for signalling or simple control functions. Specifications are included. Brooks Rotameter Co.
▲ For a copy, circle 192 on Post Card

NEW DRAW-OUT DESIGN
LIMITAMP* MOTOR CONTROL

CONTACTOR IN PLACE

. . . speeds Limitamp control inspection and maintenance

Rated 2300- to 4600-volts for a-c motors up to 3000 hp.

Maintenance is an easy job with General Electric's new draw-out Limitamp control. Routine maintenance is quickly performed with the contactor in place.

Coils and contact tips can be changed in a matter of minutes. Simply lift out the arc chutes and one arc horn to expose the bolts holding coils and tips in place.

To make your job still easier, a magnet-head wrench is supplied with each unit. This wrench fits all bolts necessary to change coils and tips. And, remember . . . Limitamp control is all front connected.

To replace fuses, you just pull the ejector and the fuses pop up. When a fuse is replaced, it is guided into position by a back-stop on the clip.

Another feature of new Limitamp control is a special test circuit—built into each control unit. Simply bring in external control power and connect it to the terminal board. You can then safely operate the panel—isolated from its normal power source with the door open—to check out the unit before putting it into service.

Ask your G-E Apparatus Sales Engineer or Agent about other advanced-design maintenance, installation, operation and performance features of Limitamp control. Or, write Sect. 783-14, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

Progress Is Our Most Important Product

GENERAL ELECTRIC

* Reg. Trade-mark of General Electric Company

For more facts circle 648 on Reply Card

BULLETINS

(Begins on page 23)

Alarm/Control System—Bulletin ECM 119, about 16 pp, describes a high-capacity alarm/control system providing an inexpensive method of locating faults at unattended operations and controlling on-off functions remotely. Tells how equipment can be "customized" to suit supervisory or control needs. General Electric Co.
For a copy, circle 193 on Post Card

Sliding Gate Regulators—Presented in 8-pp Catalog J160-1 is information on sliding gate pressure regulators. Describes applications of self-operated, pilot-operated, solenoid-operated and back pressure regulators; contains cutaway drawings, sizing charts, flow curve. OPW-Jordan Corp.
For a copy, circle 194 on Post Card

Improved Thermocouples—Catalog G100-4 outlines the Megopak line of hard-pack small-diameter, mineral-insulated thermocouples. Contains specifications, ordering information and prices on bulk material, elements and assemblies. Minneapolis-Honeywell Regulator Co.
For a copy, circle 195 on Post Card

New Approach to Leveling—Components and operation of an optical leveling kit are illustrated and described in this 8-pp bulletin. Contains data on industrial alignment problems and solutions, including foundation or bed leveling, profiling, differential leveling and checking movement. Keuffel & Esser Co.
For a copy, circle 196 on Post Card

OTHER EQUIPMENT

Safety Work Gloves—Illustrated and described in a 12-pp bulletin released by Advance Glove Mfg. Co. is a line of safety work gloves. Covers every style and fabric, including flannel gloves in knit-wrist, band-top, gauntlet, and reversible styles, double-quilted and double-palm and chore types, jersey and Permatex, plastic and Neoprene gloves. Advance Glove Mfg. Co.
For a copy, circle 197 on Post Card

Hose Clamps—Sixteen-pp Booklet 5-60 contains illustrated information on standard clamps used in a variety of industrial and other applications for hose, flexible plastic pipe and duct connections. Wittek Mfg. Co.
For a copy, circle 198 on Post Card

Extruded Plastics—Comprehensive data on custom extrusions of plastic is presented in this 72-pp profusely illustrated catalog. Covers design and application of extrusions, and includes cross-sectional diagram of extruded moldings, data on shrinking plastic to shape, table of properties and characteristics of extruded plastics. Anchor Plastics Co., Inc.
For a copy, circle 199 on Post Card

Applications Directory—This 122-pp pocket-size booklet is a "where to use it" guide for company's tapes, adhesives, sealants, coatings and electrical insulating materials. Based on classified telephone directory listings it covers major types of industry and businesses showing which products are used for specific applications in each. Permacel.
For a copy, circle 200 on Post Card

Paging System—Features and advantages of company's selective, wireless paging system are illustrated and described in Form S-150. Describes components and typical installations. Stromberg-Carlson Div., General Dynamics.
For a copy, circle 201 on Post Card

Screw Thread Guide—This 16-pp basic guide to screw thread technology defines terminology used in the industry and explains with diagrams the differences between major kinds of screw threads. Charts detail measurements, characteristics and capabilities of standard thread types, as well as tapping and wood screws, and a torque guide outlines normal load values applicable to bolts of various metals. The H. M. Harper Co.
For a copy, circle 202 on Post Card

Tabulating Card Files—Storage for tabulating cards and magnetic tapes are illustrated and described in this 12-pp bulletin. In addition to vertical tabulating card file, describes latest in mechanized filing. Remington Rand Div., Sperry Rand Corp.
For a copy, circle 203 on Post Card

Mortise Locks—Presented in this 32-pp catalog is detailed information on company's mortise locks and latches. Along with descriptive details and illustrations, it includes complete specifications. Sargent & Co.
For a copy, circle 204 on Post Card

Water Requirements Calculator—With this calculator you can quickly figure conversion of ppm water hardness to grains per gallon hardness, amount of exchange resin needed, brine and salt requirements, and brine tank size and operating brine level adjustments. Calculator can also be used in selecting tank size for liquid volume problems. Morton Salt Co.
For a copy, circle 205 on Post Card

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 243 and 244.

PUMPS AND COMPRESSORS

Vertical Turbine Pumps—Featured in this product bulletin is a line of vertical turbine pumps job-engineered to suit specific applications in industry. Design, construction details noted. Fiese & Firstenberger Mfg., Inc.
For a copy, circle 301 on Post Card

Centrifugal Pumps—Bulletin 720.4 gives data on materials of construction, performance curves and dimensions of full line of single stage, end suction, open impeller centrifugal pumps, 13 sizes, 1¼-in to 8-in, capacities to 3000 gpm, and heads to 180 ft. Goulds Pumps, Inc.
For a copy, circle 302 on Post Card

Torque-Flow Pump—Bulletin P10-B45 describes a submersible torque-flow pump for submerged cleanout operations, sewage wet wells, digesters, grit chambers and other industrial applications. Discusses principle and includes specifications, selection chart. Western Machinery Co.
For a copy, circle 303 on Post Card

Oil-Less Air Compressors—Twelve-pp Bulletin GO-259 describes features and applications of oil-less air compressors and vacuum pumps. Detailed selection tables are included. Bell & Gossett Co.
For a copy, circle 304 on Post Card

Air Compressors—Featured in this product Bulletin CAS-18 are air compressors designed for a variety of industrial applications, including tank or base mounted units, simple compressors, single and two-stage, air cooled, electric or gasoline driven, ¼ to 50 hp. Curtis Mfg. Co.
For a copy, circle 305 on Post Card

Industrial Compressors—Oil-free heavy-duty industrial compressors are illustrated and described in 12-pp Bulletin A-92. Cutaway views show details of internal design and construction, and bulletin includes photos of typical installations. Joy Mfg. Co.
For a copy, circle 306 on Post Card

Oil-Free Compressors—Described in Bulletin 202-B are compressors designed to compress air or gas entirely free of any oil or oily vapors due to lubricants. A large cutaway view illustrates component features. Pennsylvania Pump and Compressor Co.
For a copy, circle 307 on Post Card

Water-Cooled Compressors—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features included. Gardner-Denver Co.
For a copy, circle 308 on Post Card

Compressed Air Fundamentals—Sixteen-pp Form 1548A is intended to aid in selecting a small, "packaged" air compressor. Discusses compressed air, how it is compressed, single- and two-stage compressors, piston displacement, control used, etc. Includes information on compressor oils, pipe sizes, wire sizes. Ingersoll-Rand Co.
For a copy, circle 309 on Post Card

NEW BULLDOG XL BUSTRIBUTION DUCT...

3 WAYS SAFER FOR PEOPLE AND PROPERTY

HERE'S THE FIRST DEAD-FRONT plug-in duct. Butyl insulation covers the full length of each silvered aluminum bus bar, *even in bus plug openings*. You get positive protection for personnel against accidental contact with "live" bars.

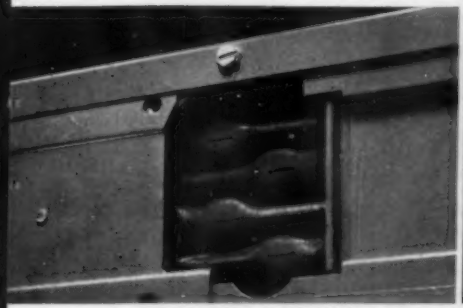
PLUG-IN SAFETY DOOR IS ALWAYS CLOSED during installation of XL Safety Plug. Interlock finger positively prevents plug installation or removal when Safety Door is open . . . and it keeps door from closing against "live" plug fingers.

THERE'S NO ARCING to endanger people or property . . . you can't plug in or unplug when the switch is "ON."

New XL BUStribution® Duct cuts down installation time . . . takes less space . . . reduces duct weight on building structure as much as 40%. Keyed bus ends slip together in a hurry while a single integral bolt locks joints securely under a ton of pressure.

Ask your BullDog distributor to arrange for a demonstration. You'll see how fast-to-install XL BUStribution Duct and matching Safety Plugs really are!

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N. Y.



IT'S TRUE DEAD-FRONT. Each silvered aluminum bus bar is full-length insulated with Butyl envelope.

IT'S A SAFETY DOOR. You can't plug in or unplug with the door open, can't close door on "live" plug fingers.

IT'S A SAFETY PLUG. You can't plug in or unplug against a load . . . safeguards personnel and equipment against arcing.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

KEEP PACE ELECTRICALLY

For more facts circle 649 on Reply Card

DATA FILE

(Begins on page 248)

Unit-Type Compressors—Again available to power engineers is 12-pp Bulletin SG-2 on unit type compressors. Illustrated in color, this bulletin uses photos and cutaways to describe single- and two-stage compressors from ½ to 15 hp, available pressures from 80 to 250 psi. Specifications list cfm displacements, pressures, weights, dimensions and rpm. Le Roi Div., Westinghouse Air Brake Co.

▲ For a copy, circle 310 on Post Card

110 Psi Air Compressors—Bulletin 185, 12 pp, presents company's Balanced/Opposed air compressors for standard 110 psi industrial applications. Describes details of the compact heavy-duty design: Balanced/Opposed cylinders; rugged crankcase and compressor cylinder construction; overhung rotor, unloader controls etc. Clark Bros. Co.

▲ For a copy, circle 311 on Post Card

PACKINGS, SEALS

Mechanical Packings—Featured in 24-pp Catalog 56 are several recent packing developments including the multi-purpose Bel-Vee V-Ring packings, the long wearing crisscross braid packing series, twisted foil packings for oil and distillate temperatures to 1000 F, and an Inconel-wire reinforced plastic packing for valves handling superheated steam at temperatures up to 800 C. The Belmont Packing & Rubber Co.

▲ For a copy, circle 312 on Post Card

Piston Packing—Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions. Darling Valve & Mfg. Co.

▲ For a copy, circle 313 on Post Card

Self-Lubricating Packings—Featured in this 30-pp Bulletin PC-103 is detailed information on company's line of packings with internal lubrication. Application chart, table of physical properties, and ordering instructions. Greene, Tweed & Co.

▲ For a copy, circle 314 on Post Card

Mechanical Seal—Performance and design features of Mechanipak PK mechanical seals for a variety of operating conditions are detailed in 8-pp Bulletin AD-150. Cutaway views, diagrams and tables of dimensional data included. Garlock, Inc.

▲ For a copy, circle 315 on Post Card

Safety-Relief Valves—Liquid relief and special service safety-relief valves, including a new, low cost compact series, are presented in 28-pp Catalog FE-138. Valves shown include types for hydraulic pressure systems, liquefied gases, chemical corrosive service and general industrial service. Sizing information, capacity data given. Farris Engineering Corp.

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Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive chemicals and atmospheres detailed. Jenkins Bros.

▲ For a copy, circle 317 on Post Card

Choosing the Right Valve—Importance of choosing the right valve is stressed in this 20-pp Bulletin AD-2016. Describes three principal valve types—gate, globe and check valves—their design and service characteristics, lists names of valve parts, describes disc-stem connection, bonnet and bonnet-joint characteristics, materials. Crane Co.

▲ For a copy, circle 318 on Post Card

Automatic Valve Actuator—Catalog V-200 describes the Valvmatic, a valve actuating unit designed for converting hand-operated valves to automatic operation. Advantages are detailed and a drawing shows design features. Photos illustrate installation. C. H. Wheeler Mfg. Co.

▲ For a copy, circle 319 on Post Card

Nuclear Valves—Described in this Product Bulletin N2-12-585M are valves designed for critical applications in the nuclear industry. Covers valves for a wide variety of radioactive and non-radioactive services, including reactor coolant and moderator systems, fuel processing, waste disposal systems. Nuclear Div., Alloy Steel Products Co.

▲ For a copy, circle 320 on Post Card

Steam Trap—Bulletin 257 describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

▲ For a copy, circle 321 on Post Card

On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. steel and semi-steel, and helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation. Armstrong Machine Works.

▲ For a copy, circle 322 on Post Card

PVC Pipe, Fittings—This 12-pp bulletin contains latest technical information on polyvinyl chloride pipe and fittings, including advantages and properties, general characteristics and applications, physical flow rate charts and complete specifications. Also included is a chemical resistance chart. Mueller Brass Co.

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UPVC Pipe, Fittings—Technical data and installation information on unplasticized polyvinyl chloride pipe are provided in 24-pp Booklet TTP-119. Also gives specifications for threaded and socket types of UPVC fittings, valves and flanges, or normal and high-impact material. Tube Turns Plastics, Inc.

▲ For a copy, circle 325 on Post Card

Valved Couplings—Features and applications of company's valved couplings designed for instant shut-off are detailed in Bulletin H-1686. Covers couplings for high pressure, vacuum and very low pressure, for impact air lines and for hard to handle fluids. Snap-Tite.

▲ For a copy, circle 326 on Post Card

LUBRICANTS, LUBRICATION

Organized Lubrication—Benefits of organized lubrication—major cost control factors are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority are covered. Texaco, Inc.

▲ For a copy, circle 327 on Post Card

Lubricant Data—Characteristics, advantages of company's line of specialized fluid and grease type lubricants are describe in 32-pp Data Book 59-2. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

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FANS, VENTILATING AND AIR CONDITIONING

Duct Fans—Bulletin AF-1 describes axial flow duct fans, including both direct drive fans for moving noncorrosive, moderate temperature air, and the belt driven type for high heat or corrosive atmospheres. Dimensional data included. Bowman Steel Corp.

▲ For a copy, circle 329 on Post Card

Mechanical Draft Fans—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Complete application, performance and physical data are given, as well as a list of accessories. Sturtevant Div., Westinghouse Electric Corp.

▲ For a copy, circle 330 on Post Card

Standard Duty Fans—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 572. Points out advantages, shows arrangement and application, describes accessories. The New York Blower Co.

▲ For a copy, circle 331 on Post Card

Ready Units—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

▲ For a copy, circle 332 on Post Card

For Air Purification—Twelve-pp Bulletin 108 A describes and illustrates Dorex activated carbon air purification equipment—C cells and H canisters. Data on equipment selection, installation and application is given,

TURBO-COMPRESSORS AND BLOWERS

2500 cfm and up

By Eugen P. Eicher, M.E., Brown Boveri Corp.

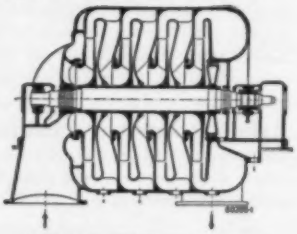
BROWN BOVERI

Brown Boveri offers complete compressor sets including compressor, choice of drives and all auxiliary equipment. Brown Boveri manufactures all the components, assembles and tests the complete sets in their own workshops and assumes full responsibility for the complete unit.

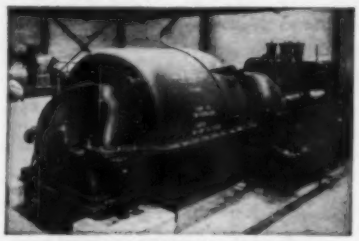
Compressors include a full range of centrifugal and axial types. Drives include steam turbines, gas turbines, expander turbines and electric motors. (Where hot waste gases are available, for example, a combination of motor-generator and exhaust-gas expander turbine drives has reduced power costs 60 to 70%.) Auxiliary equipment includes gear sets, pressure and volume regulators, air and gas coolers and complete electrical control systems.

Brown Boveri compressor sets are used by many leading U. S. companies and are backed by engineering skill, product reliability, and complete U. S. service staff and facilities.

2500 to 175,000 cfm at up to 60 psi* Uncooled centrifugal blowers



Four-stage centrifugal compressor.



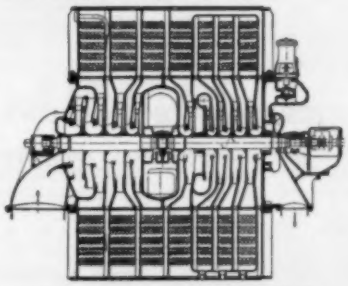
One of two 40,000 cfm centrifugal blowers with steam turbine drive in a copper conversion plant, Arizona.

First developed by Brown Boveri. Advantages over reciprocating compressors in the above ranges: lower cost, higher efficiency, less maintenance, less floor space and *clean, oil-free air.*

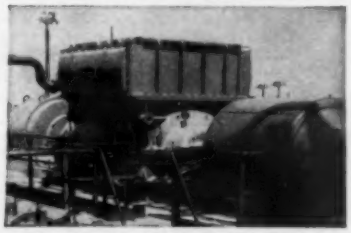
Standard designs are for air or non-poisonous, non-corrosive and non-explosive gases. Stainless steel impellers, shafts, etc. are available for corrosive gases. High-pressure casings and oil type sealing glands are available for higher pressures.

Applications: Blast furnaces, converters, coke ovens, gas distribution, process air and gases, air separation plants, sewage aeration, tunnel ventilation.

5000 to 80,000 cfm at 60 to 120 psi* Internally-cooled "Isotherm" centrifugal compressors



Nine-stage "Isotherm" compressor with anti-surge power-recovery turbine.



"Isotherm" compressor driven by a synchronous motor (left) and a waste-gas recovery turbine (right) at a California chemical plant.

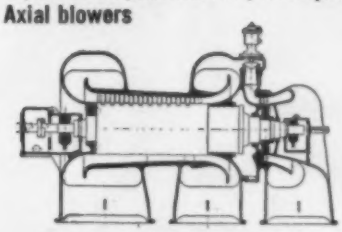
Highest inherent efficiency. Ten basic models with 6 to 9 stages per casing. Impeller diameters from approx. 1 ft. to 4 ft. The larger models include a built-in power-recovery turbine to allow running at loads below the surge limit.

Stainless steel impellers, shafts, etc. are available. For discharge pressures higher than 120 psi, "Isotherm" compressors are followed by an uncooled centrifugal compressor or other booster.

Drives: Four-pole synchronous motors are generally preferred for 1500 hp and larger units, other type motors for smaller sizes. Speed-increasing gears are used with all motor drives. Variable-speed steam or gas turbines are direct coupled.

The reliability of "Isotherm" compressors is proved by hundreds of installations in mines, shipyards, chemical process plants, air liquefying plants, aerodynamics laboratories.

10,000 to 500,000 cfm at up to 80 psi* Axial blowers



Ten-stage axial compressor with anti-surge power recovery turbine.

Axial blower, steam turbine drive, supplying 70,000 cfm of air for a blast furnace.

Substantially more efficient than centrifugal units for large air volumes where adequate pressure can be delivered with a single unit and without cooling. The higher efficiency allows smaller and better drives and lower cost. A power-recovery turbine may be built in to permit operation at volumes below the surge limit.

Drives. Steam turbines allow simple, automatic control through Brown Boveri pressure-oil governors with pressure or volume regulator. Brown Boveri gas turbines and electric motor drives of all types are also available.

Applications: Gas turbines, wind tunnels and chemical plants. In Europe, Brown Boveri axial compressors driven by gas turbines are widely used for blast furnace air with substantial power savings.

**Capacities for single machines. Higher discharge pressures can be obtained by combining various types of equipment in series.*

BROWN BOVERI

U. S. Sales and Engineering: Brown Boveri Corp., Dept PL-8, 19 Rector Street, New York 6, N. Y. Agents in 27 U. S. cities.

For more facts circle 650 on Reply Card

Hints on fluorescent starter selection

G-E STARTERS GIVE YOU SPECIAL PROTECTION AGAINST SHOCKS

General Electric puts insulating liners in its fluorescent starters, to protect maintenance people against the slightest chance of a shock. The liners prevent inside elements from touching and charging the outside metal can — a possibility in unlined starters if they are mistreated or dropped.

For extra safety — use G-E starters. And to get helpful starter ideas, ask your G-E distributor for the "G-E Starter Selection Chart and Maintenance Guide for Fluorescent Lighting." General Electric Company, Wiring Device Department, Providence 7, R. I.

GENERAL ELECTRIC

For more facts circle 651 on Reply Card

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DATA FILE

(Begins on page 248)

also information on replacement service. Connor Engineering Corp.

▲ For a copy, circle 333 on Post Card

Air Conditioning Units—Bulletin 786 contains 54-pp of selection data on air conditioners, including capacities, standard arrangements, dimensions, etc. Steps in selection of basic unit and components are outlined. First pages are devoted to choosing physical size based on air capacity and face velocity requirements. Succeeding pages concern themselves with heating and cooling requirements. American Air Filter Co., Inc.

▲ For a copy, circle 334 on Post Card

Air Conditioning Cabinets—Bulletin AC-121, 28-pp, details and illustrates with photos, drawings and curves, the construction features, unit arrangements, physical data, fan performance, dimensions, and coil ratings of central station air conditioning cabinets. Bulletin covers four general types. Buffalo Forge Co.

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STORAGE, SHOP EQUIPMENT

Storage Racks—Bulletin R-400, 12-pp, illustrates and describes a wide variety of storage racks manufactured by the company. Application drawings, photos and diagrams are included. Chicago Tramrail Corp.

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Storage Equipment—Reference Manual 487 contains 64-pp of descriptive data on a line of steel storage equipment, including shelving, bins, doors, slotted angle, drawer units, lockers, benches, grating, counters, and other items. Assembly details and dimensional data included. Equipto.

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Steel Equipment—Catalog 100 H contains 92-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specifications. Lyon Metal Products, Inc.

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Flexible Steel Shelving—Advantages of Erectomatic steel shelving are illustrated and described in 8-pp Form 2451-D. Various types of shelving available is shown and dimensional data given. Columbia-Hallowell Div., Standard Pressed Steel Co.

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MECHANICAL POWER TRANSMISSION

Power Transmission Products—Catalog 759 contains 104-pp of engineering data, specifications and prices on roller chain, sprockets, couplings and conveyor chain. Data includes material on selection of roller chain drives, speed ratios for sprocket combinations, chain length tables, illustrations

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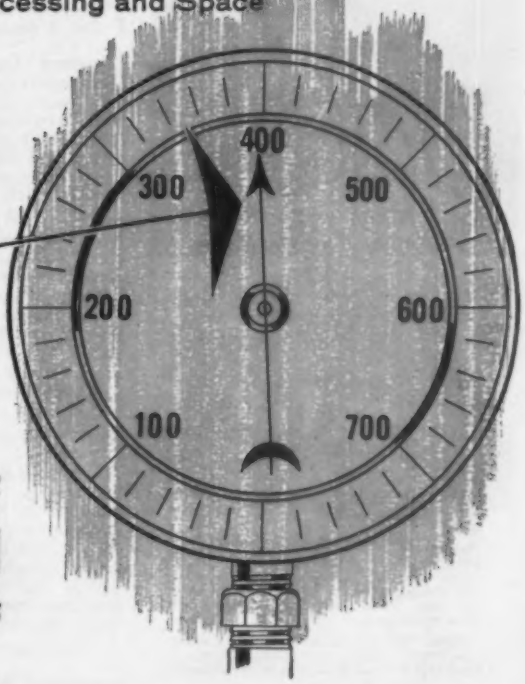

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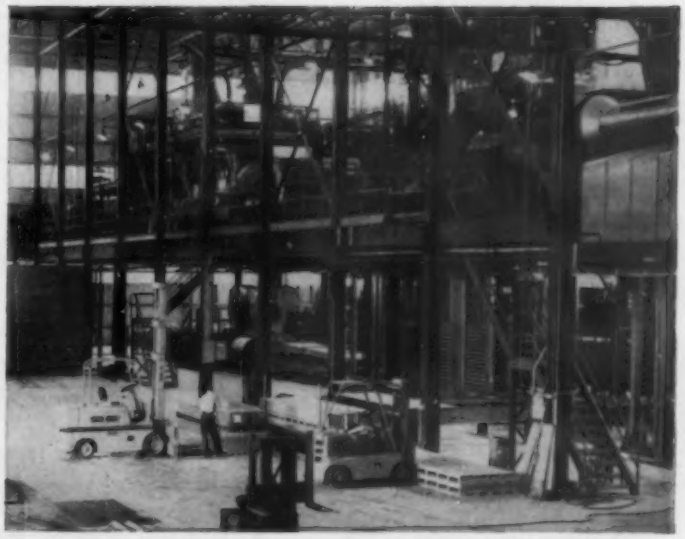

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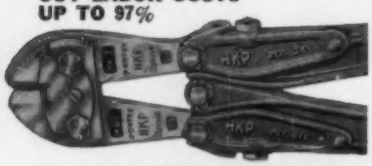

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DATA FILE

(Begins on page 248)

of various standard attachments, and technical specifications. Diamond Chain Co., Inc.

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Planetary Gears—Eight-pp Bulletin 2401 covers company's planetary and star gears, used for boiler and feed and circulating water pump drives, compressor and blower drives, and as drives for turbines and internal engines. Includes cutaway drawings, information on construction details. De Laval Steam Turbine Co.

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Screw Conveyor Drives—Bulletin 7106 presents 20 pp of data on screw conveyor drives for applications in range from ½ to 30 hp, in four ratios, designed to bolt to standard trough ends. Design features and accessories are described, selection and dimensional data included. The Falk Corp.

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Multiple V-Belt Drives—Catalog DH-901, 24 pp, lists advantages and features of the HC V-belt drive designed to reduce drive costs and take up 50 per cent less space. Ratings, installation information and drive selection tables are provided. Stock sheaves and bushings are also described. The Gates Rubber Co.

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Grommet V-Belts—Advantages of company's grommet V-belts are illustrated and described in this 8-pp bulletin. Belt features are fully described, and a section on how to figure a V-belt drive is included. Goodall Rubber Co.

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Transmission Belting—Application information on company's line of transmission belting is presented in 16-pp Bulletin S-5174. Specific types of belting for a variety of applications is illustrated and described, and technical data tables, and a selection table for drives included. The Goodyear Tire & Rubber Co.

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Welded, All-Steel Pulleys—Eight-pp Bulletin 558 describes features and advantages of company's welded, all-steel pulleys with "Curve Crown" rim for maximum belt training effect and minimum belt wear. Table of dimensions and weights included. Stephens-Adamson Mfg. Co.

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Magnetic Pulleys—Features and advantages of company's magnetic pulleys for removing tramp iron and small iron contamination, preventing machinery damage, fire and explosions are detailed in this product bulletin. A general guide to pulley selection covers types of tramp iron, principle of pulley operation, capacities, dimensions. Eriez Mfg. Co.

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Anti-Friction Bearings—Catalog 424-B covering "the broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

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Spring Clutches—Described in this 30-pp catalog are five standard lines of spring clutches in bore sizes from ⅛ to 1 in., torque capacity to 1250 lb-in., for use in applications utilizing drive up to 5 hp. Clutches offered include over-running and back-stopping; indexing; on-off; on-off indexing; and safety lock control. Marquette Div., Curtiss-Wright Corp.

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Flexible Couplings—Comprehensive selection data on flexible couplings is presented in 48-pp Engineering Catalog 60. Misalignment is described and basic coupling arrangements and load classifications are included, along with photos of couplings, etc. Thomas Flexible Coupling Co.

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Coupling Data—An integrated selection of product bulletins and data on company's line of couplings for a variety of industrial applications is presented in this handy ringbound notebook. The notebook contains sections on product literature, engineering data, instruction sheets, application data, and price lists. To all of these sections, additional material can be added as it becomes available. Koppers Co., Inc.

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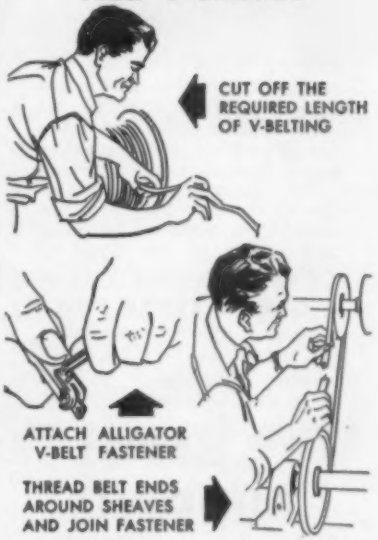
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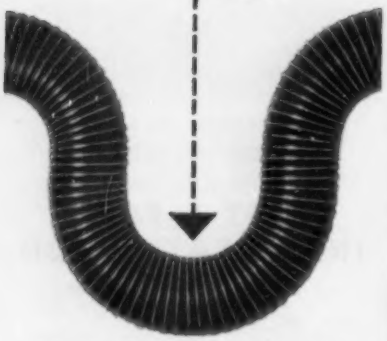

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DATA FILE

(Begins on page 248)

HOSE, FITTINGS

Improved Pressure Hose—Form NEPR-500, 24-pp, describes Hytron hose and couplings. A section on engineering facts on this hose covers its advantages, applications, limitations. Booklet also gives tips on installation, chemical resistance tables, temperature and pressure ranges. The Imperial Brass Mfg. Co.

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Flexible Metal Hose—Featured in 8-pp Catalog 188 is a line of flexible metal hose, as well as rubber and synthetic hose. Detailed specifications and dimensional data are included. Flexonics Corp.

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INSTRUMENTS, CONTROLS

Automatic Controls—Selection and application information on a line of automatic controls for steam and water service is presented in this 46-pp Engineer's Manual. Covers controls for fuel oil heaters, heat exchangers for cooling, instantaneous heat exchangers, jacket water cooling, process hot water, pressure reducing. The Powers Regulator Co.

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Explosion-Proof Controls—Advantages of company's explosion-proof controls, indicating, non-indicating and recording, are detailed in this product bulletin. Design features and ratings given. The Partlow Corp.

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For Limited Panel Space—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a 20-in. scale. The Liquidometer Co.

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For Process Industries—Gages and instruments for the process industries, including pressure and vacuum gages, indicating pneumatic controllers, and pneumatic transmitters, are featured in Bulletin 3015. Includes construction details and technical data. United States Gauge Div., American Machine and Metals, Inc.

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Meters, Regulators, and Valves—Bulletin C-5000, 28-pp, describes and illustrates meters, regulators and valves for a wide range of services. They include gas meters, gas pressure regulators, industrial meters, water meters. Information includes application suggestions, specifications and references to more detailed product literature. Rockwell Mfg. Co.

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Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages

New ball valve for corrosive service ...easier to operate and maintain

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are illustrated and described, with applications and specifications fully detailed. Jas. P. Marsh Corp.

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Shock Testing Machines—Illustrated and described in Bulletin 59-07 are shock testing machines to accommodate a wide variety of test requirements. Gives maximum load, table capacity, dimensional data and power supply. Barry Controls Inc.

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DUST, FUME CONTROL

Dust Control Systems—Bulletin 104, 36-pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information on other dust filters. The W. W. Sly Mfg. Co.

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Dust and Mist Collectors—Illustrated and described in this fold-out, chart-size Bulletin 736 is company's line of dust and mist collectors and accessory equipment. Detailed specifications are included. Aget Mfg. Co.

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WATER, WASTE TREATING

How Corrosion Attacks—This water conditioning data sheet explains how and why boiler, cooling and process water systems are constantly plagued by corrosion. Discusses such factors as pH, dissolved solids, temperature, flow rate, dissimilar metals, carbon dioxide. Betz Laboratories, Inc.

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Consulting Service—Advantages of company's consulting service are detailed in 8-pp Bulletin 5006-A. How the service is qualified to solve problems concerning scale and corrsion control in boilers, cooling systems, and process waters is discussed. Dearborn Chemical Co.

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Solids-Contact Reactors—Eight basic requirements of solids-contact reactor design are outlined in 20-pp Publication 5001-C. Advantages of solids-contact are enumerated, operation of company's reactor described, and data on selecting reactor top area for various applications covered. Cochrane Corp.

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Coagulant Aids—Eight-pp Bulletin HSP-919 describes coagulant aids used to speed up and improve coagulation and sedimentation in water clarification systems. It also covers uses in waste water systems, cold and hot process softening, oil field waterflooding, brine clarification, color removal, high solids, liquid separation. Hagan Chemicals & Controls, Inc.

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BOILERS

Hot Water Boilers—Catalog HCC-2, 20-pp describes and illustrates design, construction advantages and economies of company's controlled circu-

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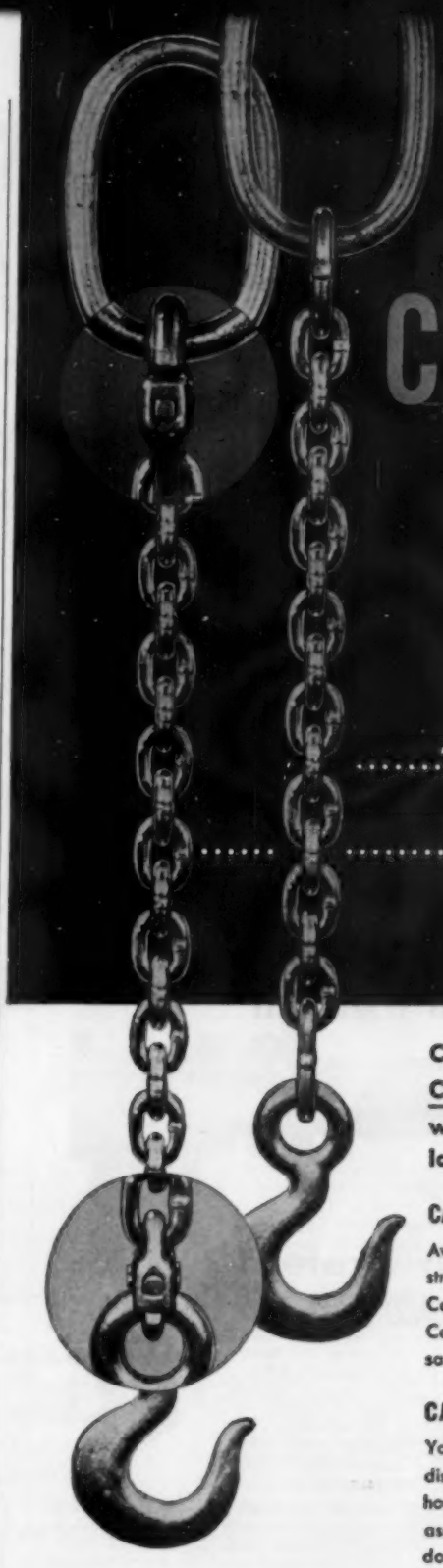

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DATA FILE

(Begins on page 248)

lation hot water boiler for supplying high pressure, high temperature water for heating systems and process use. Combustion Engineering, Inc.

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Bent Tube Boilers—Design and operation features of company's bent tube boilers for power, processing or heating are detailed in 22-pp Bulletin VF-VS-2. Boiler sections of typical installations and principal data on each are included. Henry Vogt Machine Co., Inc.

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Boiler Construction—Bulletin BE100 describes advantages of practical boiler construction with 2 pass design, featuring comparable results with equal heating surface, but with Continental's two-pass features—turbulent spinning gas technique-uniform heating, no refractory baffles and symmetry of furnace layout. Boiler Engineering & Supply Co.

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Generators, Auxiliaries—20-pp Catalog SB 60, on steam generators and allied equipment, provides cross section views of major products to show design and construction. Standard and special boilers are included, also burners, Erie City Iron Works.

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Packaged Generators—Detailed information on company's line of package steam and hot water generators is presented in illustrated Form 35. Advantages of design are discussed. Cyclotherm Div., Crane Co.

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Steam Generators—Advantages of company's steam generators designed to adjust to actual production needs are detailed in this 6-pp Product Bulletin C-731. Schematic diagram showing operating details is included. Clayton Mfg. Co.

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SAFETY, SANITATION

Fire-Resistant Fluids—This series of specification sheets describes company's line of fire-resistant fluids including synthetic, oil-water emulsion and glycol types. Physical characteristics and other data given. Mobil Oil Co., Inc.

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Handling Flammable Liquids—Problems involved in the use of flammables in individual processes, and methods and equipment required for safe control are described in this 76-pp safety handbook. Physical properties and characteristics of most commonly used flammables are detailed; recommendations for safe handling given. The Protectoseal Co.

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Special Fire Protection—Devoted to special fire protection, this 44-pp booklet covers both equipment and methods. Tells how to recognize special fire-hazards conditions in a plant. Discusses in detail major types of fire protection, telling how each functions, giving it advantages and limitations, and illustrating some examples of successful use. Grinnell Co., Inc.

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Hand Soaps—Advantages of company's all-soluble borax hand soaps are covered in Form 571025 G. Reports of typical users are included. Sugar Beet Products Co.

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MATERIALS HANDLING

For Overhead Handling—Illustrated and described in 8-pp Bulletin PU-50-U is a line of overhead handling equipment, including hand chain hoists, electric hoists, cranes and trolleys. Capacity tables are included. Chisholm-Moore Hoist Div., Columbus McKinnon Corp.

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Conveyor System—Construction and operating features of company's Power-Flex and free conveyor system for industry-wide application are illustrated and described in 6-pp Bulletin 159. Advantages are detailed and specifications given. Conveyor Div., Columbus McKinnon Chain Corp.

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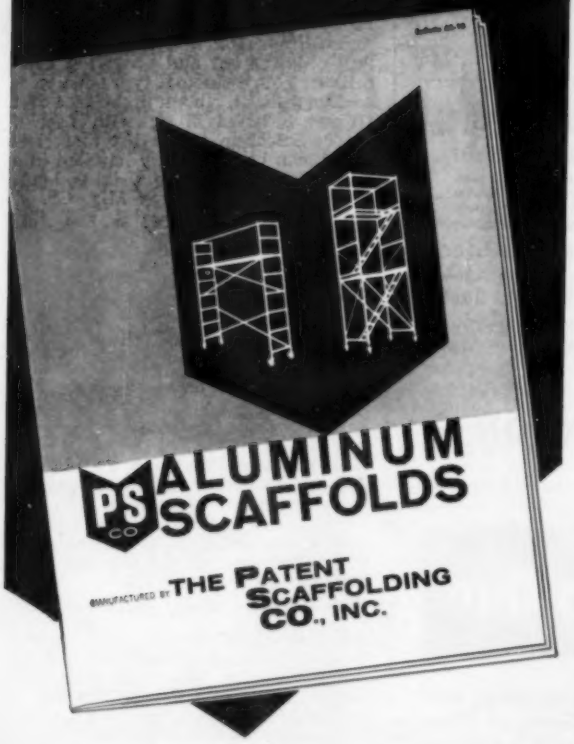

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opens and closes automatically by simple lever device—on all step-ladders equipped with pail rests

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- No nails—tie rods pass thru step grooves or recessed knee braces for stronger, longer-lasting support on Tioga, Samson, Utility, Electric, Underwriter Stepladders

NEW
- Heavy gauge top iron wraps around ends of top piece for extra strength—on Tioga, Samson, Utility and Electric

NEW
- Non-split, two-piece top riveted to iron support of Tioga, Samson, Utility, Electric

These four exclusive design features of "Gold Medal" Step Ladders are truly functional, and are not gingerbread. They were adopted after considerable study, with the sole purpose of making famous "Gold Medal" Step Ladders even more durable.

Flush step construction, a plus feature incorporated about two years ago, is another example of the constant search for ways to improve "Gold Medal" Ladders for every purpose, with top quality in every price range.

WRITE FOR BULLETIN L-94

FOR GREATER SAFETY...EFFICIENCY...ECONOMY

GOLD MEDAL LADDERS SCAFFOLDING

THE PATENT SCAFFOLDING CO., Inc.

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For more facts circle 663 on Reply Card

Boiler down-time cut 60% with

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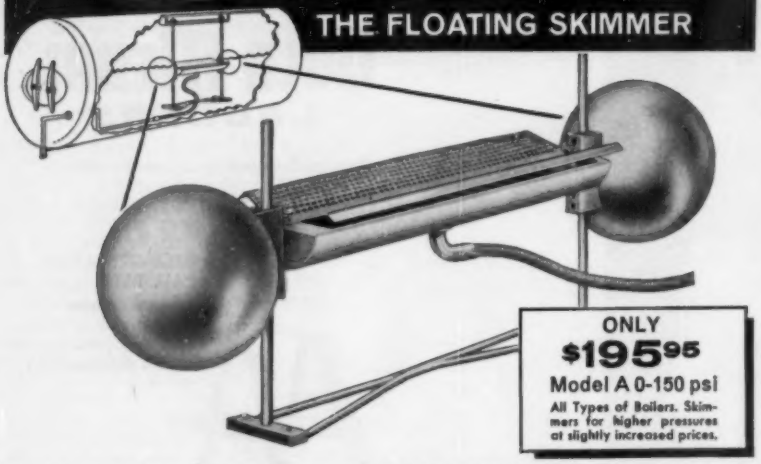
THE FLOATING SKIMMER



Tests and user reports prove SurfBlow Floating Skimmers cut down-time up to 60%—reduce blow-off over 50% for internally treated boilers—cut water treatment over 45% in many installations!

SurfBlow automatically skims off boiler water impurities from the critical steam release zone, whatever the turbulence or water level fluctuation. Simple to install. Made of maintenance-free stainless steel. Pays for itself in weeks—even days! Write now for complete information.

BOILER SPECIALTIES CORPORATION

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Eight Separate Meters In One

Ideal for general testing and maintenance, the General Electric AK-4 Hook-on volt-ammeter combines eight meters in one.

A twist of the selector switch changes scales; only the range you select shows. You eliminate the confusion and possible misreadings of multiple scales. With its five current and three voltage ranges, it is ideal for troubleshooting, appliance testing, and starting-current checks. Also, the Type AK-5, with four current ranges and three voltage ranges, is suitable for most of these same applications.

Write now for product bulletin, GEA-6292C, to Section 597-08, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

For more facts circle 665 on Reply Card

DATA FILE

(Begins on page 248)

tion of screw conveyors, screw feeders, and components is presented in 78-pp Book 2989. Contains descriptive sections on screw conveyors and their uses, types of components, engineering of screw conveyors, screw feeders, components. Lists materials for which conveyors may be used. Link-Belt Co.

For a copy, circle 382 on Post Card

On Spiral Conveyors—Described in 60-pp Catalog 951 are spiral conveyors and fittings for meeting practically any requirement and operating conditions. Four principal types-helicoid, sectional flight, ribbon flight, and cast iron—are listed along with special types. Selection tables list materials which can be effectively handled in a spiral conveyor, giving weights, loading classes. The Jeffrey Mfg. Co.

For a copy, circle 383 on Post Card

Vibrating Conveyors—Advantages and features of vibrating conveyors are detailed in 16-pp Catalog 66. Layouts and flow charts showing how conveyors can be designed to perform a wide variety of processing operations at the same time the material is being conveyed are included. Ajax Flexible Coupling Co., Inc.

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Belt Fasteners—Bulletin F-112D, 6-pp, describes company's belt fasteners and rip plates designed to join and repair conveyor and elevator belts in any width. Application procedure is illustrated, necessary tools described. Flexible Steel Lacing Co.

For a copy, circle 385 on Post Card

Adjustable Ramps—Contained in this 8-pp bulletin is detailed information on a line of powered adjustable ramps for loading docks. Factors to be considered when selecting a leveling device to meet varying operating requirements are covered. Rowe Methods Inc.

For a copy, circle 387 on Post Card

Sheet and Coil-Lifters—Bulletin SL-30, 16-pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and dimensions included. Cullen-Friestedt Co.

For a copy, circle 388 on Post Card

Cost-Cutting Materials Handling—"The How Book of Cost-Cutting Materials Handling," is a 24-pp booklet covering various phases of the materials handling problem and their effect on industrial production. Text and pictures cover such subjects as fundamental handling motions, advantages of planned material handling practices. The Yale & Towne Mfg. Co.

For a copy, circle 389 on Post Card

Integrated Materials Handling—Case History Bulletin 276-2 tells how five types of hand and powered equipment for warehousing, process, shipping and receiving have been inte-

grated for efficiency in one typical application. Describes high lift narrow aisle rider trucks, low lift platform "walkies," low lift narrow aisle rider trucks, hand lift trucks. Lewis-Shepard Products, Inc.

▲ For a copy, circle 390 on Post Card

SLINGS, CHAINS WIRE ROPE AND FITTINGS

Sling Chains—Steps to follow in ordering sling chain for particular applications are outlined in 16-pp Catalog S-558. Lists grades of chain available for sling chains and their specifications, working load limits and information on care and use of sling chains. Campbell Chain Co.

▲ For a copy, circle 391 on Post Card

Wire Rope Inspection—Service Bulletin 104 outlines a wire rope inspection program designed to insure maximum operating safety and efficiency at minimum cost. Point by point check-up is given. Leschen Wire Rope Div., H. K. Porter Co., Inc.

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Rugged Roller Chain—This technical folder describes offset side bar roller chain designed for applications where operating conditions are severe. Full details on the chain are given as well as drawings of its construction, tables of sizes and sprockets. Atlas Chain & Mfg. Co.

▲ For a copy, circle 393 on Post Card

Drop Forged Fittings—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Crosby-Laughlin Div., American Hoist and Derrick Co.

▲ For a copy, circle 394 on Post Card

MAINTENANCE

Metal Surface Treatment—This 40-pp catalog on metal surface processing (cleaning, washing, rinsing, drying, and spraying flow and dip coating) illustrates and describes drum-type machines, conveyor machines and systems, combination drum and conveyor machines, monorail machines, finishing systems. Ransohoff Co.

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Masonry Treatment—Water-proofing, protective and corrective treatments for masonary are described in 20-pp Circular 17. A variety of applications are illustrated, and suggested specifications are given. Standard Dry Wall Products, Inc.

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Planned Maintenance—Data Sheet SD-5925-A covers basic requirements for architectural planning to assure better industrial and institutional housekeeping. Covers avoidance of unnecessary dust catching surfaces, cleaning of new facilities before occupancy, construction of walls and corridors, design and construction of custodial storage facilities. Puritan Chemical Co.

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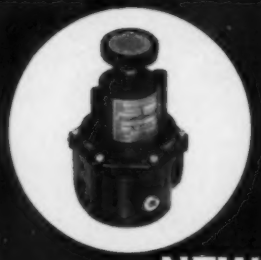

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Designed for low headroom and faster hoisting. Plain, durable construction for long, trouble-free service . . . will pay for itself in short order.

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DATA FILE

(Begins on page 248)

Industrial Vacuum Cleaning—Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. Recent improvements in collection and dumping methods are also covered. Spencer Turbine Co.

▲ For a copy, circle 398 on Post Card

Electric Power Sweeper—A battery powered, aisle-designed, silent, fume-free sweeper is described in Bulletin 85. Photos, advantages, features and mechanical data also given. G. H. Tennant Co.

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For Overhead Maintenance—Bulletin G205RR, 8-pp, tells how to control costs when maintenance goes above arm's reach—for painting and cleaning, electrical work, etc. Pictures a variety of scaffolding arrangements. Provides brief product information on steel and aluminum scaffolding, ladders. The Patent Scaffolding Co., Inc.

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Pyramid Ladders—Catalog 158, 20-pp, describes a line of pyramid-design step ladders, as well as hydraulic lifts and fixed or adjustable-level work platforms for above-floor working safety. Illustrates 35 new models of ladders for working heights up to 15 ft. Ballymore Co.

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TOOLS, WELDING AND MACHINE SHOP

Power Tools—Catalog 1(J) contains 68-pp of comprehensive selection data on power tools, including belt sanders, bench grinders, buffers, chain saw attachment, cleaners, coal drills, die grinders, drills, drum vacuum cleaners, impact wrenches, planes, saws, sanders, screw drivers, and others. Includes detailed specifications. The Black & Decker Mfg. Co.

▲ For a copy, circle 402 on Post Card

Power Tools—Presented in this 64-pp 1960 catalog is manufacturer's line of power tools for industrial production, plant maintenance, construction, wood and metalworking and other uses. Saws and accessories, hammers, planes, routers, sanders, drills, drivers, wrenches, shears, polishers, grinders and abrasive products are included. Catalog is generously illustrated with photos of products, features and applications, Skil Corp.

▲ For a copy, circle 403 on Post Card

Fastening Tool—Illustrated and described in Catalog Form B-141 is the Duo-Jobmaster—designed to handle the tough fastening jobs into steel or concrete. Features and advantages detailed. Ramset Div., Olin Mathieson Chemical Corp.

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Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

▲ For a copy, circle 405 on Post Card

Screw Fastening of Aluminum—This 48-pp technical handbook covers various types of standard and special fasteners and fastening systems used to join aluminum assemblies. Supplemented with numerous illustrations and tables, it includes list of manufacturers of special screw fasteners and recommended hole sizes for various types of self-tapping screws in sheet aluminum, other materials. Reynolds Metals Co.

▲ For a copy, circle 406 on Post Card

Welding Equipment—Twelve-pp Bulletin W-158 features a line of transformer, rectifier and rotary d-c welders for a variety of industrial requirements. Detailed specifications and dimensional data are included. Harnischfeger Corp.

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Welding Flux Recovery—This bulletin tells how company's equipment salvages unused flux from submerged arc welding, removes powder and returns slag-free, dust-free flux to welder in a continuous flow. Dimensions and specifications are given for both stationary and portable models. Invincible Vacuum Cleaner Mfg.

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EXECUTIVE REPORT #6

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No problem is too tough for Wheelabrator® Dustube® Collectors

High temperatures, corrosive or abrasive contaminants in the collected gases pose no insurmountable problems for Wheelabrator Dustube Collectors. These efficient cloth bag type collectors are made exceptionally versatile by use of synthetic filtering fabrics of treated glass, Nylon, Orlon, Dacron, etc., which afford long service life and optimum resistance to acids, alkalis or abrasive materials encountered in any specific application. For example, with Wheelabrator Glastube® collectors employing glass filter fabric tubes, temperatures up to 550° F. can be accommodated.

Dustube Collectors offer high efficiency and low cost for equipment and operation

Collection efficiencies uniformly above 99% by weight and 95% by discoloration test are regularly achieved by Dustube systems in a wide range of applications. For engineering information write to Wheelabrator Corp., 859 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ontario.

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ULTIMATE PROTECTION against fine iron and tramp iron contamination for most liquid-handling pipelines. Ideal for installation in food, chemical and ceramic applications. Protect product purity. Increase production. Prevent abrasive wear; reduce damage to filters, mixers, pumps, etc. Made with strong, one-piece cast bodies, Ferrous Traps withstand pressures up to 150 psi. Provide greater magnetic area than all previous models. Effective with materials up to 750°F. Quickly pay for themselves. Two types: standard stainless steel models and highly polished sanitary models.

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Welding Wires—Submerged arc and inert gas welding wires are featured in Bulletin DH-402-C. Typical applications of various stainless steel, low alloy, and mild carbon steel automatic welding wires are described. Page Steel & Wire Div., American Chain & Cable Co., Inc.

▲ For a copy, circle 409 on Post Card

Machine Mounts—A vinyl cork, sisal machine pad and an adjustable machine mount for reduction of transmitted vibration and no bolting of machine are described in literature available from the company. Clark-Cutler-McDermott Co.

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Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44-pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oil and paste compounds, and prevention of dermatitis. Conversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

▲ For a copy, circle 411 on Post Card

LIGHTING, COMMUNICATION

Lighting Units—Design and performance advantages of Wide-Lite units for use with color-corrected mercury vapor lamps are detailed in this product Bulletin 405. Typical candlepower distribution curves are included. Wide-Lite Corp.

▲ For a copy, circle 412 on Post Card

Fixtures for Industry—Details of the CFI—comfort for industry—the uplight fluorescent lighting fixtures are covered in Form OD-1022, 16-pp. Typical installations, comparisons, size and types, and specifications are included. Day-Brite Lighting, Inc.

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Lighting Supports—Channel type lighting supports for installing wiring and electrical lighting fixtures are described in 8-pp Bulletin G-2. Recommendations for applications, installation procedures, features and data are covered, and photos, dimensional data included. Steel City Electric Co.

▲ For a copy, circle 414 on Post Card

Floodlights, Accessories—Pocket-size Bulletin 2714, 184 pp, a miniature catalog, provides information on how to select floodlights, including general purpose, heavy duty, mercury vapor, and special types. Covers lighting for hazardous locations, searchlights, underwater lighting, floodlight poles, accessories. Also gives installation suggestions. Crouse-Hinds Co.

▲ For a copy, circle 415 on Post Card

Lamp Data—Incandescent and fluorescent lamps are featured in this 16-pp bulletin. Selection tables list complete descriptive and electrical details. Champion Lamp Works.

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Lamp Annunciators—Outstanding features, operation, indications, mounting, relay cabinet (types, dimensions) relay plug-ins (operational sequences, types) audible signals (bells, buzzers,

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with new
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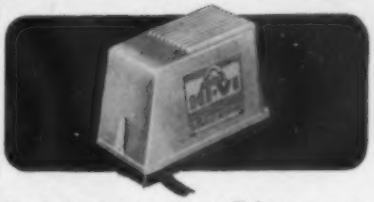

Here's the newest and most efficient answer to those hard-to-move materials in sticky bins . . . designed to provide superior operating efficiency . . . exclusive pinpointed vibration gets right to the trouble spot — starts stubborn materials moving!

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Eriez Mfg. Co., 71-HB Magnet Dr., Erie, Pa.

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For more facts circle 668 on Reply Card

DATA FILE

(Begins on page 248)

horns) and ordering information are covered in this 24-pp Bulletin 6041. Drawings, pictures and engraving data are included. Edwards Co., Inc.

For a copy, circle 417 on Post Card

Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regradless of distance or surrounding noise conditions. Gai-Tronics Corp.

For a copy, circle 418 on Post Card

TV at Work—This 8-pp brochure, "How Many Jobs," covers an extensive line of industrial television equipment. Shows cameras, control units, monitors, accessories, and projection systems. Varied applications, including installations with unusual engineering requirements pictured. General Precision Laboratory.

For a copy, circle 419 on Post Card

ELECTRICAL

Single-Phase Motors—Bulletin 470-B describes integral horsepower single-phase motors, ¾ to 20 hp, in open, protected, totally enclosed fan-cooled and explosion proof frames. Bulletin outlines company's "weatherizing" treatment which makes motors suitable for use in damp, dirty or corrosive atmospheres. Motor Div., Robbins & Myers, Inc.

For a copy, circle 420 on Post Card

Distribution Transformers—Dry type distribution transformers, single and three phase, are featured in 16-pp Bulletin 5A2-BL01. Wiring diagrams and detailed specifications are included. Acme Electric Corp.

For a copy, circle 421 on Post Card

Electrical Controls—Featured in this 80-pp Bulletin LO-11 is a line of electrical control equipment, including safety switches, service control, load centers, and accessories. Describes design and construction features, and includes detailed selection tables and case dimensions, wire tables. Cutler-Hammer Inc.

For a copy, circle 422 on Post Card

Distribution Panelboards—Bulletin 402 covers fusible-type distribution panelboards including both pull-out and hinged cover-operated switches. Describes panelboard layout method and includes size and capacity data. Frank Adam Electric Co.

For a copy, circle 423 on Post Card

Molded Case Breakers—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and selection data, including section on determining ampere rating, is furnished. General Electric Co.

For a copy, circle 424 on Post Card

Distribution Equipment—Detailed information on company's line of electrical distribution equipment is presented in 82-pp '60 Marketeer, Catalog M-160. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

For a copy, circle 425 on Post Card

Individually Enclosed Breakers—Featured in 8-pp Bulletin 4261-2B are individually enclosed-low-voltage power circuit breakers featuring visible break disconnect contacts. Selection chart, application data given. I-T-E- Circuit Breaker Co.

For a copy, circle 426 on Post Card

Switch Wiring Diagrams—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

For a copy, circle 427 on Post Card

Dual-Element Fuses—Advantages offered by company's dual-element cartridge fuses are detailed in 12-pp Bulletin 1330. Describes knife-blade and ferrule types, and includes time current curves. Economy Fuse Div., Federal Pacific Electric Co.

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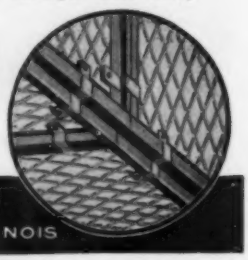
GLOBE SAFE·GARD EXPANDED METAL PARTITIONS with exclusive QUIK-ERECT patented fittings

(FORMERLY HILMAR)

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe·*Gard* panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE·GARD Quik-Erect Clips securely joining the interchangeable panels.

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Distributors in all principal cities, listed under "Grating" in your phone book.

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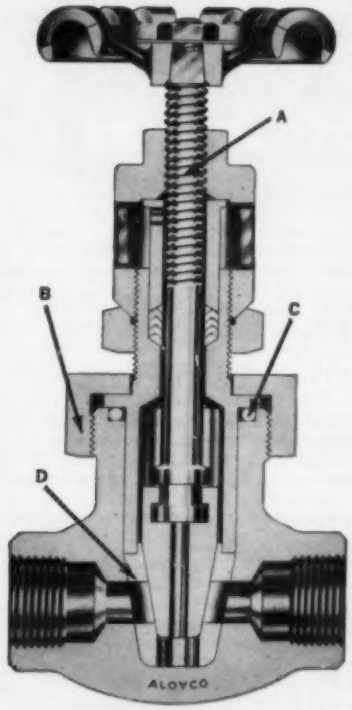

Shown ⅔ actual size of the half-inch valve

WHY? **A. OUTSIDE STEM THREADS** are away from corrosive area, prevent galling.
B. UNION BONNET provides extra strength and easy disassembly.
C. O-RING made of "Teflon"* provides tough, leak-proof seal.
D. SEATS made of "Teflon"* are pressure-tight, dependable, won't gall. Renewable.
STAINLESS STEEL: 18-8S, 18-8SMo, Aloyco 20.

FOR: Instrument lines, small lines handling viscous fluids, or where low pressure drop is important.

FACTS: full-floating plug disc exerts no twisting action on the removable seat in closing. Aloyco Stainless Steel #66 Plug Gate Valve: 1200 lb. at 150 F.; 600 lb. at 500 F. Sizes: ⅛", ¼", ⅜", ½". Want more? Write: Alloy Steel Products Company, 1308 West Elizabeth Ave., Linden, New Jersey. O.S

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Longer Lasting ALOYCO VALVES

ALLOY STEEL PRODUCTS COMPANY

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Electric Safety Switch—Design features and advantages of company's electric safety switches are outlined in this product Bulletin PL-250. Component details are illustrated and described and selection table included. The Clark Controller Co.

▲ For a copy, circle 429 on Post Card

Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

▲ For a copy, circle 430 on Post Card

Rubber Power Cable—This 32-pp catalog contains detailed information on design features, insulations, and performance highlights of butyl rubber power cable. Includes data on available constructions, ampacity and installation data. Anaconda Wire & Cable Co.

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Sheathed Cable—Construction details and performance data on company's sheathed cable, available in steel, copper, aluminum and bronze, are presented in 16-pp Bulletin 1031. Complete engineering data, installation and application information, test results included. Simplex Wire and Cable Co.

▲ For a copy, circle 432 on Post Card

Rubber-Jacketed Cord—Illustrated and described in this product bulletin is a line of rubber jacketed portable electrical cord. Construction details and advantages are covered. Western Insulated Wire Co.

▲ For a copy, circle 433 on Post Card

On Motor-Generator Chargers—Operation and maintenance procedures for automatically controlled vertical motor-generator chargers for lead-acid storage batteries are provided in 8-pp Form 5845. Contains instructions on day-by-day operation and long-range preventive maintenance of equipment, wiring diagrams. Exide Industrial Div., The Electric Storage Battery Co.

▲ For a copy, circle 435 on Post Card

Battery Technology—Bulletin GB-1896 is a 36-pp handbook of technical instructions and engineering data on the care of motive power storage batteries. Covers all phases of lead acid battery theory, operation and maintenance. Provides basic information on specific gravity changes, charging cycles. Gould-National Batteries, Inc.

▲ For a copy, circle 436 on Post Card

Cable Support—Described in 28-pp Catalog 5912 are two types of cable trays or tube raceways, the ladder type and the basket small opening type, for cable, wiring and tubing support. Detailed dimensional data, transverse loading data, specifications, photos and diagrams are included. The Globe Co.

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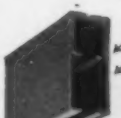
WITH TELEMATIC AUTOMATIC DISPATCH CONTROL

• *Simply set dials and Telematic guides carrier to any station in system*



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Power-Flex is designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. The most economical system available for loads up to 600 lbs. per carrier. Savings in actual installations range from 25% to 60%.

*Systems in service for your inspection.

Engineered to your very specific requirements.

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CM CONVEYORS

COLUMBUS McKINNON CHAIN CORPORATION
Conveyor Division
TONAWANDA, N. Y.

For more facts circle 673 on Reply Card

Portable Test Units—Bulletin SB-RT-1, 48-pp, describes and illustrates the portable test units for protective relays with ratings from 0.4 to 2-kva. Contains information on classification of relay tests; preparation for testing; testing and maintenance programs; tips on selection. Multi-Amp Div., Multi-Amp Electronic Corp.

▲ For a copy, circle 438 on Post Card

Surface Metal Raceways—Eight-pp Form 607 describes features and advantages of company's surface metal raceways and multi-outlet systems. A variety of typical applications are illustrated, and capacity data given. The Wiremold Co.

▲ For a copy, circle 439 on Post Card

Junction Boxes—Illustrated and described in this product booklet on junction boxes, including explosion-proof types, dust-tight boxes, and weather-proof boxes. Descriptive details and dimensional data included. Killark Electric Mfg. Co.

▲ For a copy, circle 440 on Post Card

HEATERS, HEATING

Infra-Red Heaters—Bulletin CS-305 gives specifications, operating costs and typical applications for three portable gas-fired infra-red heaters. Describes principles and advantages of heaters that heats the workman and his tools but not the air. Perfection Div., Hupp Corp.

▲ For a copy, circle 441 on Post Card

Gas-Fired Duct Furnaces—Featured in 6-pp Bulletin 659B are gas fired duct furnaces which can be installed in multiples. Advantages are discussed and dimensions and performance data given, Modine Mfg. Co.

▲ For a copy, circle 442 on Post Card

Industrial Heating—This 64-pp application manual contains information needed for designing industrial heating jobs using direct fired heaters. Comprehensive text covers definitions of terms, explanation of direct fired heaters, heat loss calculations, air distribution (nozzle and duct), single and multiple installations, door heating, process heating, make-up air, fuel piping. Lennox Industries Inc.

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Instant Hot Water—Described in this product bulletin is a heater package designed to give accurately controlled hot water under varying loads. Table of heating capacities is included. Fulton Sylphon Div., Robertshaw-Fulton Controls Co.

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For Heating, Ventilating—Performance and dimensional data on a line of ventilating and heating equipment is presented in 8-pp Bulletin S-317. Featured are centrifugal fans, centrifugal roof ventilators, propeller roof ventilators, propeller fans, wall mounted fans, various unit heaters. Ilg Electric Ventilating Co.

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Heating, Air Conditioning—Featured in 20-pp Bulletin B-151A is company's line of air conditioning and heating equipment. Illustrated and described are air conditioning units, convector radiators, perimeter heating, hot water heating equipment, heating system controls, and unit heaters. Dimensions, ratings and performance data are included. Warren Webster & Co.

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For Heating, Cooling—Technical Data Bulletin M-9 describes features and applications of company's Panelcoil for heating and cooling all types of tanks, troughs, mixers, and air duct systems. Illustrates typical installations. Dean Products, Inc.

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CONSTRUCTION

Open Web Joists—Standard and long span open web steel joists are illustrated and described in this 38-pp catalog. Advantages of the steel joist construction are detailed, and sections are included on design calculation, properties and dimensions. United States Steel Corp.

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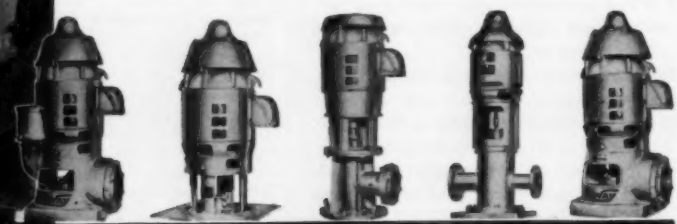

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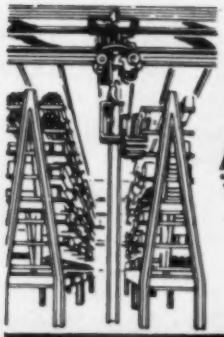

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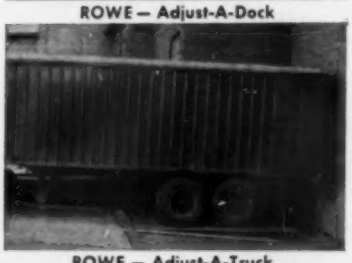

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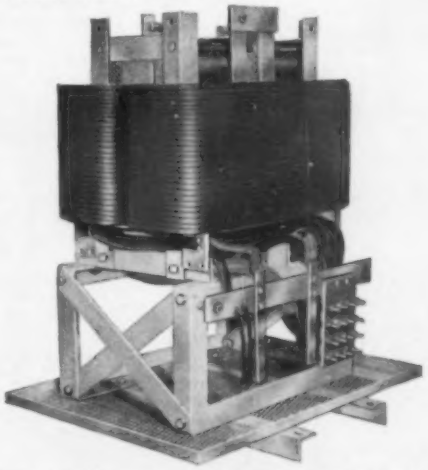

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DATA FILE

(Begins on page 248)

Steel Buildings—Advantages of building with steel are illustrated and described in colorful 12-pp Catalog B-16359. Various types of building constructions are illustrated, and details of construction shown, along with dimensional data. Armco Drainage & Metal Products, Inc.

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Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

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Aluminum in Colors—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

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Insulated Wall Panels—Eight-pp Bulletin 60W describes insulated walls and metal panels for building construction. Includes detailed information on properties and construction, specifications, installation details and color samples. Elwin G. Smith & Co., Inc.

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Grouting, Soil Stabilization—Twenty-pp Engineering Report 103 discusses a wide range of soil stabilization problems as they concern industrial construction and ultimate maintenance. Included is a paper on stabilizing a compressor foundation and a report on how to correct problems of a settling tank. Intrusion Prepakt Inc.

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Structural Clay Products—Descriptive information, photos and construction details on structural clay building materials are presented in 24-pp Catalog S-60. Characteristics and advantages of various types of facing tile, bricks, and other products are detailed, and color-photos of installations included. Natco Corp.

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Insulating Panel—Application information and design data for Asbestone insulating panels are presented in 28-pp Manual, File 19-D. Covers construction and characteristics of panels, exterior curtain wall applications, interior applications, painting and decorating panels, and specifications. National Gypsum Co.

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Functional Glass—Advantages of company's rolled, figured and wired glass for vertical sidewall and skylight glazing are detailed in Catalog 60-G, 20-pp. Describes types suited for commercial, institutional, industrial applications. Provides properties. Mississippi Glass Co.

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Ventilated Skylights—Eight-pp Bulletin 60 LV gives full details and specifications on skylights and ventilation-natural light combinations. Design features are illustrated and described and dimensional data, installation drawings, and specifications included. Jenn-Air Products Co., Inc.

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Daylighting Products—Featured in 22-pp Bulletin 585 are corrugated roof skylighting, built-up roof skylighting, Consolite skylights, continuous sash and siding, monitor and masonry walls, insulated walls, monitor with ventilating units, reglazing and vents. Physical properties of Resolite are listed and characteristics described. Resolite Corp.

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Acrylic Plastic Sheet—This 12-pp Booklet PL-415 describes properties and characteristics of Plexiglas acrylic plastic sheet. Applications in a variety of industries are illustrated, and advantages detailed. Rohm & Haas Co.

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Steel Floor Plate—Features and advantages of rolled steel floor plate are detailed in this Product Form 3184. Table of dimensional data is included, also illustrations of installations. Alan Wood Steel Co.

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Grating and Treads—Safety, visibility, permanence and easy maintenance are among advantages of open flooring discussed in 28-pp Bulletin 2527-

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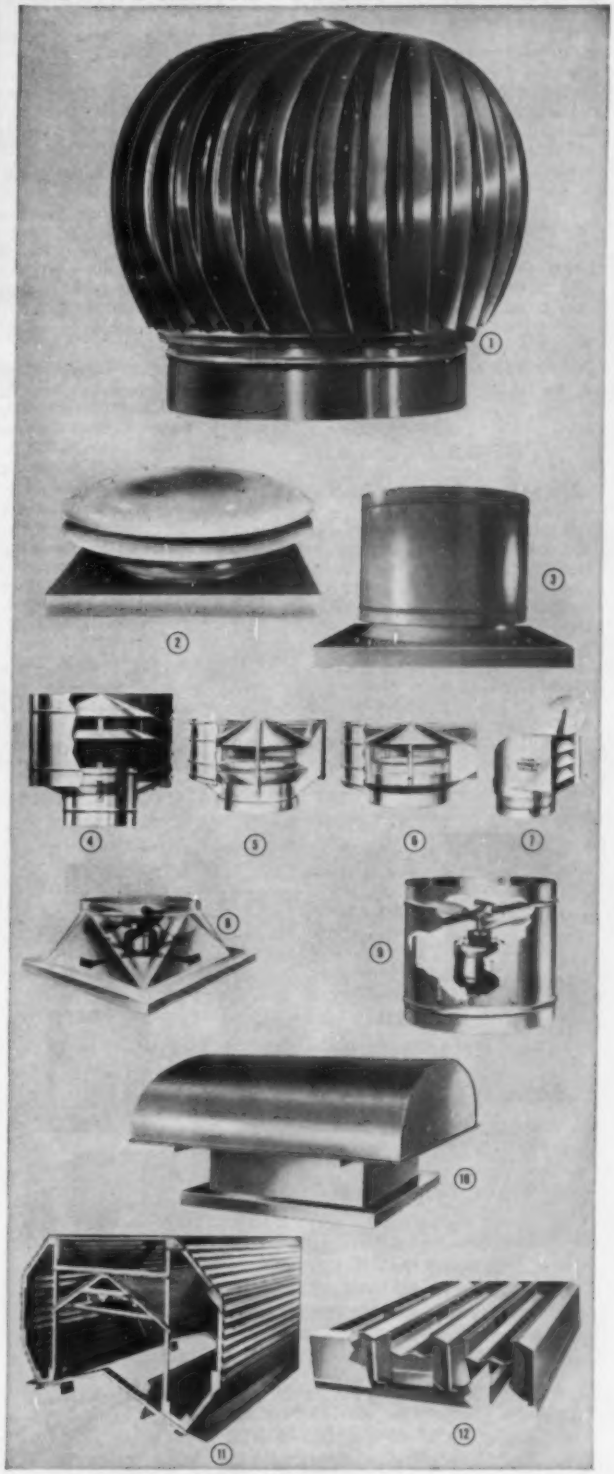

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DATA FILE

(Begins on page 248)

R. Covers use of electro-forged grating in a wide range of industries also features grating applications. Information provided includes types and spacing, bearing bar surfaces and weights, fastening methods, and safe loads. Blaw-Knox Co.

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Gratings and Treads—Bulletin 1110, 24-pp, describes welded, serrated, pressure-locked, steel, vault, platform and aluminum grating in standard and close spacing types. Stair treads are also shown. Provides tread weights, and ordering instructions. Safe loads also given. Dravo Corp.

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OTHER EQUIPMENT

Industrial Stack—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, furnaces, etc. VanPacker Co., Div., The Flintkote Co.

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Elastomer Coated Fabrics—Detailed information on synthetic elastomer coated fabrics is presented in this 12-pp bulletin. Physical properties and tests of the various synethic fabrics, uses, specifications are covered. E. I. du Pont de Nemours & Co., Inc.

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Draft Starter—Capacity data for Quickdraft units are presented in 8-pp Form QF-SD. Seven capacity tables provide means for determining capacity of standard units when installed under different conditions. Quickdraft Co.

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For Cleaner Furnace—The use and application of Oxi Crystals to keep furnaces and the fireside of boilers free of slag, encrusted carbon, soot and fire-scale is described in a recent pamphlet. Oxi-Kor Corp.

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Product Guide—This 26-pp booklet is designed to show the wide range of products manufactured by the Company. It contains an alphabetical listing of the products, with reference to engineering literature available. Allis-Chalmers Mfg. Co.

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Industrial Cooling Towers—Design and construction features of company's industrial cooling towers utilizing the cross-flow principle are detailed in Bulletin G-60. Also describes double-flow towers. The Marley Co.

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Filters for Industry—Illustrated and described in this product bulletin are filters for a variety of applications in industry. Among those covered are liquid filters, intake filters, pipe line filters, dry and viscous panel filters, precipitators, Electro-Staynew mist collector, and a dual action filter. The Dollinger Corp.

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Industrial Equipment—Featured in this 5-pp Bulletin is a line of equipment manufactured by this company, including such items as air release, can filters, capacitors, circulating lubrication systems, rate of flow controllers, dispensing outfits, filters, indicators, lubricating units, meters, oilers, pumps, valves. Bowser, Inc.

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Nickel-Chromium Alloy—Detailed information is contained in Technical Bulletin T-38, 36-pp, on Inconel X, an age-hardenable nickel-chromium alloy. Physical and mechanical properties, applications, specifications, available forms, and design data are given with graphs. Huntington Alloy Products Div., The International Nickel Co., Inc.

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For Insulation Protection—Comprehensive data on mastics, coatings, adhesives, and flashing compounds for thermal insulation has been classified as to industry usage—power, process, cold storage, marine and commercial—in this ready-reference loose-leaf manual, about 208-pp. Detailed application information and product data is included, as well as illustrations of applications. Benjamin Foster Co.

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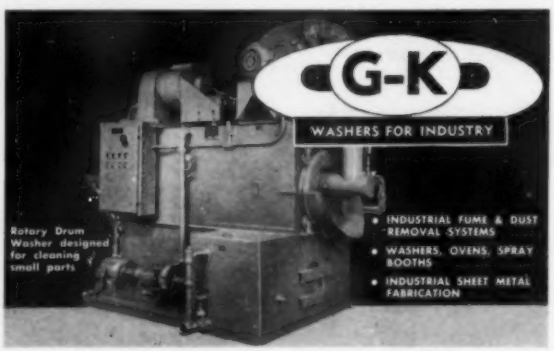
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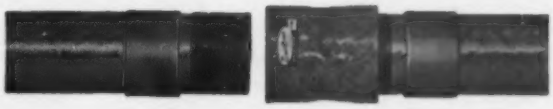

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DATA FILE

(Begins on page 248)

Cyclone Separators—Featured in 8-pp Bulletin 712 are company's cyclone separators and pipe line after-coolers designed to provide cool, dry and clean compressed air and gases. Cutaway views illustrate component parts and features, and capacity tables facilitate selection. R. P. Adams Co., Inc.

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Rotary Air Motors—Catalog 859, 8-pp, describes a line of rotary air motors, compressors, and vacuum pumps designed to give continuous air motor power or delivery. Includes dimensional diagrams, speed-hp-air consumption curves, pressure and vacuum curves, and other data. Gast Mfg. Corp.

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Why Rent Piling—Advantages of renting sheet piling are discussed in 24-pp Catalog 400. Illustrates typical installations, and typical pile arrangements for rectangular and circular cofferdams, and includes dimensional data. L. B. Foster Co.

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Fluid Mixers—Advantages and mechanical features of company's industrial mixers designed for a variety of fluid mixing operations are detailed in a series of bulletins available in this ring-bound notebook, containing Bulletins B-102, 103, 104, 108 and 111. Selection tables, outline dimensions and photos of typical applications are included, as well as specifications, mixer capacity tables, photos. Mixing Equipment Co., Inc.

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Automatic Air Products—Featured in 22-pp Bulletin 157 are automatic air products, including separators, after-driers, filterators, filters, line drains, governors and kits, combinations, regulators, and lubricators. Advantages are detailed and operation described. Wilkerson Corp.

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Aluminum Alloy Anode—Bulletin TP-115-E describes HP-4, an aluminum alloy galvanic anode for protection of tanks against sea water. Details lower amp-hour cost and other benefits afforded and compares electro-chemical properties of HP-4 with zinc and magnesium. Electro-Rust-Proofing Co.

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Corrosion Resistant Equipment—Featured in 20-pp Bulletin CE-50 are charts to aid in selecting of corrosion resistant processing equipment, based on factors of chemical resistance, physical properties and economy. Materials covered include rubber-lined steel, hard rubber, rubber plastic, vinyls, Saran and polyethylene. Resistance charts cover acids, bases, amines, esters, hydrocarbons, ketones, phenols, others. American Hard Rubber Co., Div., Amerace Corp.

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Water-Cooled Stoker—Design and operating advantages of the Vibragrate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Div., United Industrial Corp.

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Blast Cleaning Abrasives—Bulletin 903-D contains 20-pp of helpful information on economy and performance of blast cleaning operations as determined by the type of abrasive used. Contains statistical data on abrasive selection and detailed specifications on company's steel abrasives. Wheelabrator Corp.

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Classifying Systems—This bulletin covers major advantages, industrial applications and design features of high efficiency classifying systems for efficient separation or dedusting of dry powdered materials. Includes details on

operation, flexibility or arrangement, power requirements, construction. Buell Engineering Co., Inc.

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Mill Products—This 18-pp aluminum mill products bulletin gives specifications for alloys and forms of aluminum available from company. Includes details on advantages, alloy and temper designations, fatigue and shearing strengths, fabricating and finishing techniques, and describes various alloys available in foil, sheet and plate, wire, rod and bar, tubing and pipe, and extruded and structural shapes. Reynolds Metals Co.

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Pneumatic Products—Catalog 616E contains 22-pp of comprehensive information on company's pneumatic products, including filters, regulators, lubricators, combination units, air relief valves, air strainers and accessories. Specifications are given, as well as curves showing performance characteristics. Watts Regulator Co.

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Tube Cleaners—Bulletin G-515 describes company's line of air, steam and water driven tube cleaners and accessories. Photos of the various types of cleaners are included, along with descriptive details and specification data. Elliott Co., Roto Plant, Div., Carrier Corp.

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Chain Link Fence—Catalog F-915, 64-pp, contains illustrated information on company's line of chain link fences of aluminum or steel for a variety of industrial, commercial and other applications. Detailed specifications and dimensional data are included, also photos of installations. The Colorado Fuel and Iron Corp.

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Silicone Engineering Data—Summary of the forms, properties and applications of company's silicones, ranging from adhesives to release agents, laminating resins to rubber compounds, and electrical insulation to water repellents, are presented in this 16-pp brochure. Illustrated with photos, tables. Dow Corning Corp.

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Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels effectively. Air Preheater Corp.

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Paint Finishing—Six articles on factors to consider when planning a paint finishing system are contained in this 24-pp reprint. They cover conveying systems, layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment. Many photos are included, also line drawings illustrating a typical layout and giving details of metal cleaning and preparation. J. O. Ross Engineering Div., Midland-Ross Corp.

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Felt Products—This 22-pp bulletin discusses felt as a design material, covering properties of felt and applications in industry, as a friction material, for cushioning, filtering, insulating, sealing, spacing and wicking. Selection and specification data included. The Felters Co.

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Cathodic Protection—Advantages of cathodic protection against corrosion for pipelines, tank storage terminals, oil and gas well casings, and other applications are detailed in Bulletin RCR-1111. Typical installations are illustrated and described. Rome Cable Div., Aluminum Co. of America.

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Pivoted Blade Shears—Detailed information on Steelweld shears with pivoted blade design is presented in 16-pp Form 2011-H. Cutaway views showing component details are included, along with performance data, clearance dimensions and specifications. The Cleveland Crane & Engineering Co.

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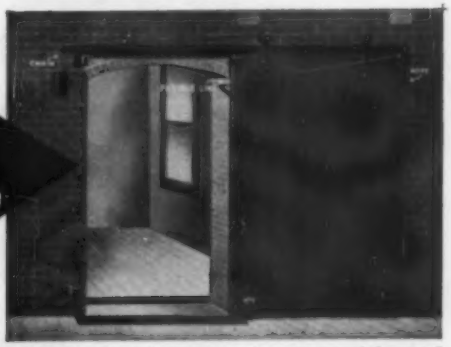

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Model 0521

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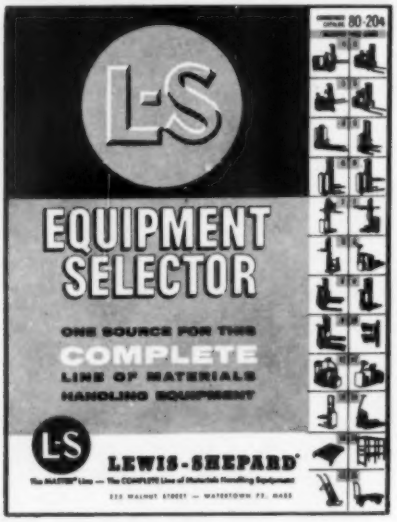

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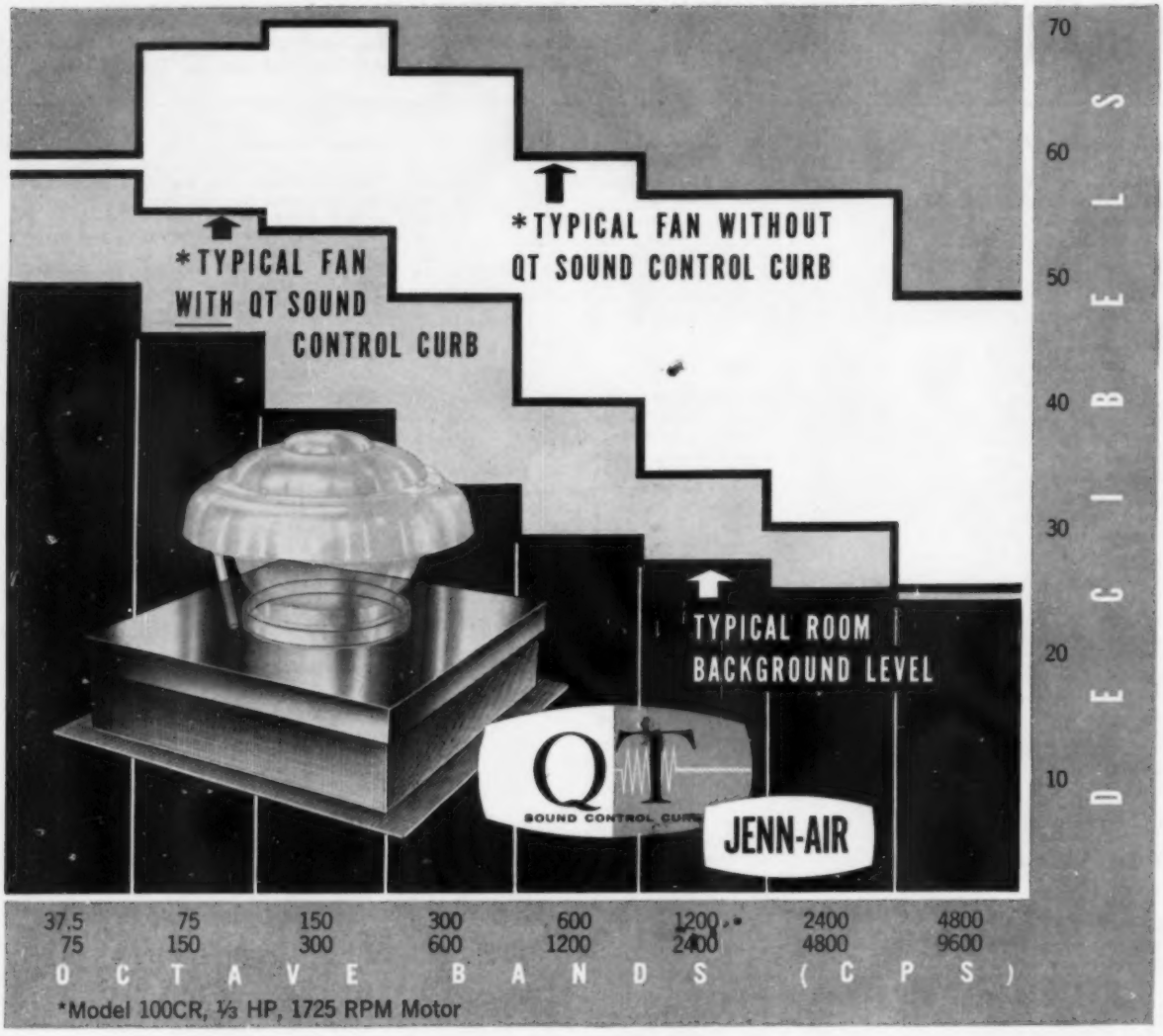

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